

INTUBATION OF LARYNX

PAPERS

*READ BEFORE THE NEW YORK ACADEMY OF
MEDICINE, IN THE STATED MEETING
OF JUNE 2, 1887.*

A. JACOBI, M.D., PRESIDENT, IN THE CHAIR

BY

A. JACOBI, JOSEPH O'DWYER, FRANCIS HUBER,
DILLON BROWN, W. P. NORTHRUP,
I. H. HANCE, AND A. CAILLÉ

*Reprinted from THE MEDICAL RECORD, June 18, 25, and July
23, 1887*

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INTUBATION.¹

By FRANCIS HUBER, M.D.,

CLINICAL ASSISTANT OF DISEASES OF CHILDREN AT THE COLLEGE OF PHYSICIANS
AND SURGEONS, NEW YORK.

IN the treatment of laryngeal stenoses depending upon the presence of pseudo-membrane (the symptoms being sufficiently well marked to warrant operative interference), the laryngeal brush, sponge, probang, and forceps; catheterization of larynx, tubage, intubation, and tracheotomy have been employed to relieve the urgent dyspnoea. The brush, probang, and forceps are but temporary expedients intended to remove loose membrane, and afford relief for the time being. Catheterization, tubage, and intubation, while facilitating the expectoration of membrane, are resorted to primarily for the purpose of relieving the dyspnoea, the immediate source of danger in the severer forms of pseudo-membranous or diphtheritic laryngitis. Tracheotomy, it is true, relieves the dyspnoea, but, for reasons apparent later on, I would advise the operation in those instances only in which intubation fails. In view of the results reported thus far such cases, I venture to predict, will be exceptional.

The brush, probang, and forceps are not often used at present. Catheterization is an infrequent procedure, and has not served its purpose as well as was anticipated. Tubage, injudiciously advocated by Bouchut and condemned by Trousseau, soon fell into disuse. In a number of text-books it is referred to in a contemptuous way and dismissed in a few words.

¹ Read before the New York Academy of Medicine, June 2, 1887.

To quote from Pepper's "System of Medicine" (vol. iii., page 107) : "Tubage was rendered ridiculous at once by the assertion of Bouchut (1858), that children suffering from croup, who were supplied by the laryngeal tube, were not only relieved at once, but expressed their gratitude in audible oratory. Still there are some cases of more recent date in which tubage is reported to have been attended with success. It is not very probable, however, that a larynx which admits of no air, because of its being clogged with firm pseudo-membrane, should be willing to admit and endure the presence of a tube." Such was the almost universal teaching up to within a short time. Physiology, theory, and practice were against the new method. To-day, however, the author of the quotation referred to above, whose name is familiar over the two continents, a strong advocate of tracheotomy, and who has performed more tracheotomies than any six American surgeons, and with the average success, proclaims himself a convert to intubation, and teaches its advantages in his clinical lectures. Recently, before the State Medical Society, he has publicly discarded the opinion expressed above, and states that a large number of children have been relieved immediately, not only temporarily, but permanently, by intubation.

Unphysiological, ridiculous, improbable, impracticable, and dangerous as the procedure may appear to those not practically familiar with the measure, hundreds of cases in the practice of various independent observers have demonstrated the practicability, utility, and advantages of intubation as originated and practised by Dr. Joseph O'Dwyer, of New York. The dyspnœa is as effectually removed in intubation as after a tracheotomy, and though the children may not thank you, the ability to speak is maintained, and the little one can express his or her wants in "audible oratory." The marked and almost instantaneous change in the appearance and condition, the quiet sleep and quiet respiration, the absence of any external wound, shock, and other evidences of

an operation more or less prolonged and difficult, impress one more forcibly than thanks. The whisper of a patient with an O'Dwyer tube in his larynx, rescued, in an incredibly short time from impending suffocation, by intubation, is more agreeable to the parents and physician than the loud tracheal breathing of a child wearing a tracheotomy tube, unable to express its wants or sensations by the least sound. I have frequently seen little patients, upon whom a tracheotomy had been performed, not able to make their attendants understand their wants, become restless, excited, and miserable, until, perhaps after the lapse of a few moments, after considerable guessing, first showing one article, then another, asking question after question of the speechless little sufferers and watching the face for an answer—finally, more by chance than otherwise, quiet down at last, when they had made themselves understood by a nod or motion, as the desired object was brought or want was gratified.

That the larynx will tolerate a tube has been demonstrated repeatedly and beyond question. The sensitive organ which rebels when a crumb of bread or a few drops of water go the "wrong way" in swallowing tolerates the tube, not for a few seconds or minutes, but for days and even weeks. The intubation-tube does not act the part of a foreign body, the presence of which excites and irritates the laryngeal orifice; the passage, so to speak, has been forced, and the tube rests within the box of the larynx and trachea and is covered by the epiglottis—rests there quietly, without exciting any reflex action or spasm. We are aware of its presence objectively by the unobstructed respiration and the full, explosive, metallic, characteristic cough induced by swallowing liquids.

Bichat reports that Dessault, in 1801, accidentally demonstrated the fact that the larynx and trachea would tolerate a tube. This knowledge he put to good use, and, in a case of oedema of the glottis, he allowed a catheter to remain for one and a half day, the patient recovering. In 1854 Horace Green announced that he could

swab out the trachea and pass a flexible tube into either bronchus, and thus inject strong solutions of nitrate of silver into tuberculous cavities. Trousseau, in his article on the "Treatment of Diphtheria and Croup," discusses catheterism of the larynx, states that Dieffenbach had practised it in 1839, speaks disparagingly of Green's method, and lauds the plan proposed by Loiseau. The latter "arms the first two phalanges of the index-finger with a bent metallic finger-stall, which leaves free the last joint and the distal phalanx. The finger thus protected is carried down into the throat as deep as possible, and with the extremity of the finger the epiglottis is raised. This being accomplished, nothing is easier than to introduce an instrument into the larynx."

In a case of œdema of the glottis Hack employed one of Schroeter's bougies. The tube was removed and the patient sent to the hospital. On the way, being attacked with severe dyspnœa, the man introduced the tube into his own larynx.

McEwen (*British Medical Journal*, July 24, 31, 1880) has shown that a catheter or tube, introduced through the mouth, may be employed as a substitute for tracheotomy or laryngotomy in case of disease or operation. Monti, of Vienna, has for years made use of hard-rubber tubes, introducing them into the larynx and allowing them to remain *in situ* twenty-four hours or more. One end protrudes from the mouth; they are resorted to as temporary expedients, made use of only until tracheotomy can be performed.

Stockton, of Chicago (*Jour. Am. Med. Assoc.*, May 2, 1885), employed silver tubes of various shapes, with and without flanges, but soon discontinued his experiments. Weinlechner, Monti (referred to above), and Schroetter have employed catheters to provide an artificial aperture in croup. Recently, catheterization of the trachea and bronchi has been revived by Reichert and others, and various applications made directly to the sub-laryngeal air-passages, the parts being anæsthetized by cocaine.

Dr. Landgraf (assistant at Professor Gerhardt's clinic) catheterized the left bronchus (man, aged fifty-two years) several times weekly, cocaine being applied to the trachea and larynx, and succeeded in passing an obstruction eleven inches down, caused by the presence of an aortic aneurism. The relief to the dyspnœa and distressing cough was enormous. To enter the domain of laryngeal surgery proper, and quote instances which exemplify the tolerance of the larynx to instrumental interference would lead me too far.

In September, 1858, Bouchut read a paper before the Academy of Medicine (Paris), entitled "A new Method of Treatment of Croup by Tubage of the Larynx." His conclusions were, briefly :

1. Tubage is easily accomplished by means of a cannula fastened upon the inferior vocal cords, without interfering with the functions of the epiglottis.
2. The tolerance of the cannula by the larynx.
3. The possibility of relieving the dyspnœa of croup and other laryngeal affections without tracheotomy.
4. The facility with which the membrane is expelled through the tube.
5. The advantages of tubage to the country practitioner far from assistance, etc.

Trousseau, as chairman of the commission appointed to investigate the subject, reported as follows :

Tubage of the larynx in certain cases of acute laryngitis can, by retarding asphyxia, prove of curative value.

In certain chronic diseases of the larynx it will allow one to delay tracheotomy, and sometimes relieve and cure the patient.

In the treatment of croup it delays asphyxia and allows a more easy introduction of air and agents capable of modifying the diphtheritic inflammation.

It can only very rarely supplant tracheotomy, which is the principal means of opposing croup when medical measures fail.

Ridiculed and condemned as unphysiological and im-

practicable by Trousseau, it fell into disuse and was soon forgotten.

Without any prior knowledge of what had been done, Dr. Joseph O'Dwyer, after a great many experiments, rediscovered intubation, and has since completely vindicated the position taken by Bouchut. The instruments devised and perfected by O'Dwyer are in no respects like those employed by the French physician. The tubes of Bouchut were hollow cylinders, narrower at one end and less than an inch long; they rested upon the vocal cords and did not reach into the trachea. A thread was left attached and was brought out at the angle of the mouth, to facilitate removal and prevent them being swallowed.

The instruments of O'Dwyer have passed through successive stages of evolution, and are too well known to require any extended description.

The number on the scale (Fig. 3) indicates the years for which the corresponding tubes are suitable. For instance: The smallest tube, when applied to the scale, will reach to the first line, marked 1, and is intended to be used up to the age of twelve or fifteen months; the size marked 2 is suitable for the next year; 3 and 4 for these years, and so on. When the proper tube is selected for the case to be operated on, a fine thread is passed through the small hole near its anterior angle, and left long enough to hang out of the mouth; its object being to remove the tube, should it be found to have passed into the œsophagus instead of the larynx.

The obturator is then screwed tightly to the introducer, to prevent the possibility of its rotating while being inserted and passing into the tube; the groove in the upper extremity of the obturator being made to correspond to the small hole in the tube intended for the string.

The following is the method of introducing the tube, which is done without the use of an anæsthetic: The child is held upright in the arms of a nurse, and the gag (Fig. 1) inserted in the left angle of the mouth, well back between the teeth, and opened widely; an assistant

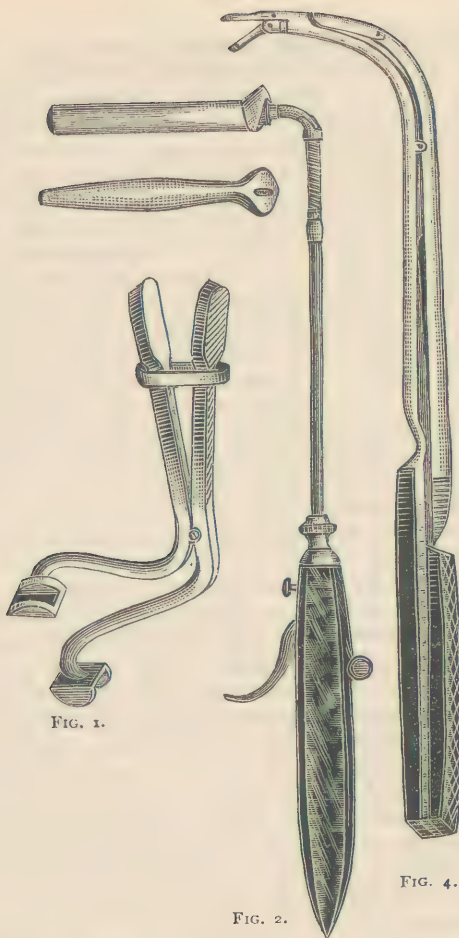


FIG. 1.

FIG. 2.

FIG. 4.



FIG. 3.

holds the head, thrown somewhat backward, while the operator inserts the index-finger of the left hand, to elevate the epiglottis and direct the tube into the larynx.

The handle of the introducer (Fig. 2) is held close to the patient's chest in the beginning of the operation, and rapidly elevated as the cannula approaches the glottis. The tube is then pushed downward, without using much force. It is then detached. The joint in the shank of the obturator is for the purpose of facilitating this part of the operation. As soon as the obturator is removed, and it is ascertained that the tube is in the larynx, the thread is withdrawn, but at the same time the finger is kept in contact with the tube, to prevent its being also withdrawn.

It is important that the attempt at introduction be made quickly, as respiration is practically suspended from the time that the finger enters the larynx until the obturator is removed. It is, therefore, under the circumstances, much safer to make several abortive attempts than one prolonged effort, even if successful.

For the purpose of removal, the patient is held in a similar position, except that the head is not inclined backward, or very slightly so, and the extractor is passed into the tube, guided by the index-finger of the left hand, which also fixes the epiglottis, and is brought in contact with the head of the cannula. Firm pressure with the thumb is then made on the lever above the handle, while the tube is being withdrawn. If secondary dyspnoea supervenes at any time the tube should be removed and a larger one substituted. If the case progresses favorably, the tube should be removed on or about the fifth day.

To avoid accidents, it is very essential to have some preliminary practice on the cadaver, particularly in extracting, which is the more difficult operation, owing to the aperture of the tube being so much smaller than that of the larynx.

In very young children particularly, extraction is facilitated by pushing the larynx upward and backward with the thumb of the left hand externally, the index-finger

being in contact with the head of the tube. In the absence of a cadaver, it has been suggested to practise intubation upon dogs anæsthetized.¹

In introducing or extracting, the instruments should be worked in the median line, the operator facing the patient squarely.

Waxham advises that in introducing or extracting, the point of the instrument should be placed under the finger, not over or alongside.

Dr. Cheatham, of Louisville, suggests that inversion of patient, or inversion with sharp blow on the back or irritating the soft palate or pharynx, may be tried in in order to remove the tube. We recognize that the tube has been successfully introduced : 1, By the occurrence of a paroxysm of coughing ; 2, by the relief of the dyspnœa. The cough is full, explosive, characteristic, and accompanied by the expectoration of large quantities of mucus and shreds of membrane.

Intubation has passed the experimental stage. It has been performed hundreds of times by O'Dwyer, Dillon Brown, and Waxham.

Northrup and Denhard have also done it in quite a large number of cases. The procedure is extensively employed in New York, Chicago, and Philadelphia, and though not as yet an established method, it has a good record and a great future.

My own cases up to the present, numbering 47, are presented in a tabulated form for convenience and ready reference.

The above list does not represent all the cases of croup treated, but only those in which operative interference was indicated. In my own practice I have not found it necessary to resort to intubation in a larger proportion than one out of three or four cases of laryngeal stenosis treated from the onset. I will say, and would emphasize the as-

¹ The finger ought to be educated and digital examinations made of epiglottides and adjoining parts in children suffering from throat-disorders.

sertion, that intubation should not be resorted to until the stenosis assumes a dangerous character and the case, if seen sufficiently early, has not been benefited by proper medicinal means. I am well aware of the truth of the statement made by Thomas: "There is nothing easier than the rejection of the testimony of others and the discrediting of the deductions which we ourselves have not drawn" ("Diseases of Women," p. 458). The instances of recovery which I report above were cases which, in the opinion of the various gentlemen present at the time, would have terminated fatally if the obstruction to respiration had not been removed. The cases were similar in severity to those in which, up to a year ago, I advocated, and would have performed, tracheotomy.

Before entering upon a consideration of the accidents, mishaps, and objections to the process, I shall devote a few words to the diagnosis of croup and the indications for operative interference. When called to a case, assure yourself that the dyspnœa is of laryngeal origin. Examine the neck and chest carefully. Inattention to this point has occasioned some grave errors. In one case the removal of a mass of poultices and bandages from the neck revealed a large abscess in front of the larynx, incision of which, with the insertion of a drainage-tube, caused the disappearance of the laryngeal symptoms. In a second case a child, sixteen months old, with hoarseness and difficulty of breathing, was referred to me with the diagnosis of croup. A careful examination of the chest revealed a large empyema. Several cases are known to me in which retro-pharyngeal abscesses have been mistaken for croup.

The diagnostic symptoms of membranous obstruction are croupy cough, aphonia, croupy inspiration and expiration, with progressive, unremitting dyspnœa, marked supra-sternal and epigastric retraction, and continued restlessness. Auscultating the chest posteriorly, we find the normal vesicular murmur feeble or absent. Finally,

cyanosis occurs, with feeble and irregular pulse. The temperature, unless there be septic absorption from diphtheritic deposits in the nose or pharynx, or some inflammatory complication in the chest, will not exceed 100° or 101° . "One of the pathognomonic symptoms of diphtheritic laryngitis, 'membranous croup,' is the relative absence of fever." "Catarrhal laryngitis, pseudo-croup, is a feverish disease. A sudden attack of 'croup,' with high temperature, provided there is no pharyngeal or other diphtheria present, yields a good prognosis; without much fever a very doubtful one." "In oedema of the ary-epiglottic folds and post-attachments of the vocal cords, with or without membranous deposits elsewhere, we have the symptoms of true croup with its dangers. Inspiration is impeded, owing to the partial paralysis of the vocal cords; expiration, however, is free, and the voice is more or less intact. Diagnosis may be made by palpation. Aphonia, with difficulty of breathing in both inspiration and expiration, points positively to membranous occlusion" (Jacobi).

True croup, as it progresses, presents a picture "the likes of which the most hardened man, the most experienced medical attendant, prays never to behold again." To relieve the sufferings and struggle of the little patient for air intubation has been proposed. And now, *when* shall we resort to operative interference? As soon as the supra-sternal and epigastric retraction is marked, when there is great and continued restlessness owing to the progressive severe dyspnœa, and the normal vesicular murmur is feeble or absent at the posterior inferior portion of the lung, we ought to intubate. Cyanosis, with a feeble and irregular pulse, pulmonary complications, or septic manifestations, ought not to deter one from intubating, even in instances apparently hopeless. It is well, however, to give a hypodermic of brandy, caffein, etc., before operating in these desperate cases.

ACCIDENTS, MISHAPS, AND OBJECTIONS. — *Gag*. — O'Dwyer's gag may be displaced by struggles of child.

Denhard's modification of above, not liable to this accident, should be employed (THE MEDICAL RECORD, April 27, 1887). If heart's action weak or general condition poor, separation of jaws by gag may cause alarming symptoms of asphyxia due to falling back of tongue. In this condition give hypodermic of brandy, or caffen, or other cardiac stimulant before inserting gag—pull tongue forward.

Thread ought to be eighteen to twenty inches long, and if not removed at once, looped over the ear to prevent its being swallowed. In a case reported by Dr. Hance, traction upon the string by the muscles of deglutition caused the tube to be pulled into the œsophagus and swallowed. In one of Dr. Agan's cases, the thread being swallowed, a bent probe was used to fish it up. In Dr. Schottky's case, the thread being too short, the tube, having slipped into the œsophagus, entered the stomach and was passed per anum two days later. (A second tube, after considerable difficulty, owing to the swollen condition of the parts, being placed in the larynx, child recovered.) Tipton (THE MEDICAL RECORD, May 28, 1887) reports that in wiping away some saliva the silken cord was caught, tube dragged out of larynx and swallowed, before the cord could be grasped. A second tube now introduced. First tube passed per rectum ten days later.

Accidents which may occur in introducing tube.—Tube.—(a) May enter the œsophagus, recognized by breathing not being improved and cough still croupy.

(b) Danger of delicate parts being lacerated; the rounded end of the obturator closes the lower portion of tube completely and prevents injury, unless force be employed.

(c) Membrane may be crowded down in front of tube. This is a possible and serious accident. When it occurs and the membrane is not expelled when the tube is removed, tracheotomy may be necessary. Dr. Ferguson reports a case in which he was compelled to perform

tracheotomy (*N. Y. Med. Journal*, March 5, 1887). In other instances this resulted in death of patient.

Dr. Waxham has devised a trachea-forceps to remove the membrane through the mouth when this unfortunate accident has taken place. He reports a case in which the accident occurred and in which a cast of the trachea and main bronchi were removed by passing the long trachea-forceps through the mouth into the larynx and trachea, in a child seven years of age (*Medical News*, January 1, 1887). "The intubation-tube was now introduced; respiration so quiet as to be scarcely observed."

In an instance in which the accident occurred to me, I gave some pure brandy (hoping that some would enter trachea through tube and cause expulsion), thus inducing a severe paroxysm of coughing which expelled tube and a large piece of membrane. The tube was reintroduced; breathing unobstructed; child recovered. In Dr. Caillé's case removal of tube was followed by expulsion of membrane.

Accidents which may occur while tube is in situ.—The lateral bulging weight of tube, together with the anatomical fit and length, tend to keep it from being coughed out.

1. *The tube may be coughed out* (a) by a severe paroxysm of coughing, (b) if too small, or (c) if a plug of mucus or membrane is below it. Not serious, as breathing is generally improved and dyspnoea will not return for several hours. This has been my experience. When dyspnoea returns tube can be reintroduced.

2. *May become occluded* by mucus or membrane. As the air is warm and moist and the inner surface of tube is smooth, mucus passes through tube readily. When tube becomes occluded with membrane the tube is coughed out in many instances. One case, however, is reported by Dr. Wheeler (*N. Y. Med. Journal*, February 26, 1887) in which plugging of tube caused death of child.¹

¹ The doctor states that "during the evening the child breathed noisily, as though there were a good deal of mucus in the tube, but apparently without any

3. Tube may be coughed up and then swallowed. Dr. Parkes refers to a case in a young lady, seventeen years of age, who passed tube per rectum twenty-four hours after intubation. In Dr. Montgomery's case it was feared that as a smaller tube than suited to age was inserted, the tube might have passed into trachea. A tracheotomy was done and child recovered. Intubation-tube passed per anum two days later (*Med. News*, March 5, 1887). It seems to me that the proper plan would have been to have inserted a second tube. Dr. S. Hemingway kindly gave me the details of a case in which, after a violent fit of coughing, hoarseness was again noticed (four days after tube had been inserted by Dr. O'Dwyer). A week later the tube was passed per rectum.

4. Tube may descend into the trachea. This accident has occurred several times. It must not be forgotten, however, that the tubes were of an earlier pattern (Waxham, *Chicago Medical Journal and Examiner*, November 25th; Eichberg, *Cincinnati Lancet and Clinic*).

The shape of the head, the resistant nature of the vocal cords, and length of tube prevent a repetition of the accident when the latest style of tubes are used.

Dr. Brothers, at my suggestion, has kindly made the following experiment in the dead-house: "The smallest-sized tube was introduced into the larynx of a child five years of age and an incision made in the trachea. Making traction below it was found that considerable force was required to pull the head of the tube below the vocal cords; it was impossible, however, to force it below the cricoid cartilage."

5. Entrance of food into bronchi and thus cause "schluck pneumonie." Discussed further on.

6. Cause ulcerations and possible hemorrhage. "The head or shoulder of tube does not rest upon the vocal

impediment to respiration. At 10 P.M. she had a severe fit of coughing, and, according to her mother's account, choked up and died in about two minutes."

The noisy breathing in the case is to me an indication to remove the tube temporarily. If this had been done the membrane no doubt would have followed removal of the tube, and the untoward result might have been avoided.

TABLE OF CASES.

Case.	Age.	Diphtheritic patches on	Complications.	Degree of stenosis.	Tube removed.	Relief of dyspnoea.	Recovery.	Cause of death.	Operator, Dr. F. Huber.	Remarks.
1	1 year.	Tonsils and pharynx.	.....	Advanced.	.....	Complete.	.....	Heart-failure 18 hours later.	Emergency call.	Tube coughed up; reintroduced.
2	2 years.	Fauces.	.....	"	.....	.....	.....	Sepsis 6 hours later.	Dr. Denhard assisting.	
3	2 yrs. 8 mos.	Nares and pharynx.	.....	"	7th day.	Complete.	Recovery.	.....	Drs. Neufeld and Mauson.	
4	6 years.	Nares and tonsils.	Measles.	"	6th day.	"	"	.....	Dr. Neufeld.	
5	3 yrs. 8 mos.	Nares and tonsils.	.....	"	.....	"	.....	3½ days later pneumonia and nephritis.	Dr. Denhard assisting.	Tonsils very large; intubation difficult in consequence.
6	3 years.	Tonsils and pharynx; membranous gangrenous.	Measles.	"	.....	Partial.	.....	Uremic convulsions 6 hours later.	Dr. Neufeld.	
7	2 yrs. 2 mos.	Tonsils and pharynx.	.....	"	6th day.	Complete.	Recovery.	.....	Dr. Neufeld.	Child had eaten a hearty meal, and each attempt at removal of tube induced vomiting; fearing that food might enter larynx, I waited until stomach was empty and then removed tube without much trouble. Brandy and caffeine injected.
8	3 years.	Nares and pharynx.	Old mitral endocarditis.	"	"	.....	"	.....	Drs. Neufeld and Mauson.	Brandy and caffeine were injected on account of weak and irregular pulse. As the patches had disappeared, tube removed on sixth day. Child comfortable. Two days later was called again (Dr. Denhard kindly seeing case with me), and found recurrence of stenosis; the ary-epiglottic folds felt swollen and rounder than normal. Again intubated, with immediate relief, and 3 days later tube removed, a pneumonia having developed in the meanwhile. Upon close questioning found that patient was allowed to sleep in a crib near the door, thus accounting for the laryngeal complication and the pneumonia. Two months later was presented at Dr. Jacobi's clinic.
9	2 yrs. 6 mos.	Tonsils and pharynx.	Measles.	"	5th day.	Complete.	.....	6 days afterward pulmonary oedema, secondary to Bright's disease.	Dr. Berlinger.	Comfortable until morning of fifth day, then rise of temperature, dulness at left apex, suppression of urine, and pulmonary oedema.
10	1 year.	Tonsils.	.....	"	Tube coughed up on 4th day.	"	Recovery.	.....	Dr. Horn assisting.	Case seen by Dr. Schlessinger, who confirmed diagnosis and regarded case as hopeless if operative measures were not resorted to.
11	2 yrs. 6 mos.	Nares and fauces.	.....	"	.....	Fair.	.....	4 hours later sepsis.	Dr. Schlessinger.	Child moribund when seen.
12	11 months.	Tonsils.	Measles two weeks before.	"	.....	Complete.	Recovery.	.....	Dr. Denhard assisting.	
13	15 months.	Nares.	Measles and gastro-enteritis.	"	.....	"	.....	Exhaustion 12 hours later.	Dr. Wilson.	
14	18 months.	Nares and pharynx.	.....	"	.....	"	.....	Pneumonia 2½ days later.	Dr. V. Rottenburg.	
15	3 years.	No patches visible; membrane coughed up.	Measles a short time ago.	"	5th day.	"	Recovery.	.....	Dr. Lilienthal.	
16	4 years.	Tonsils and soft palate.	.....	"	"	"	"	.....	Dr. Brugman.	Tube coughed up; saw case 3 hours later with Dr. Denhard. Symptoms of stenosis extreme. A larger tube (5-7 years) was then introduced and retained.
17	2 years.	Nares and pharynx.	.....	"	.....	"	.....	2½ days later pneumonia.	Emergency.	
18	3 years.	Nares and pharynx.	Hemiplegia.	"	.....	"	.....	3 days later sepsis.	Dr. Naughton.	Child had had some brain trouble during the summer, resulting in left hemiplegia. General condition poor.
19	18 months.	Nares and pharynx.	.....	"	.....	"	.....	2 days later pneumonia.		
20	11 months.	Nares and pharynx.	.....	"	.....	"	.....	2 days later sepsis.		
21	2 yrs. 8 mos.	No patches visible; pieces of membrane coughed up later.	Measles one week ago; pneumonia present.	"	11th day.	"	Recovery.	.....	Dr. Denhard assisting.	Seen 3 days before intubated by Dr. Jacobi, and diagnosis of membranous laryngitis confirmed. Tube removed on sixth day, but necessary to reintroduce it 15 minutes later. Great difficulty in nourishing the patient; resorted to stomach-pump.
22	3 months.	Nares and pharynx.	Pneumonia.	"	.....	"	.....	18 hours later heart-failure.	Dr. V. Rottenburg.	
23	4 yrs. 6 mos.	Membrane coughed up.	Measles short time ago.	"	7th day.	"	Recovery.	.....	Dr. Denhard assisting.	This patient is a sister of Case 21.
24	2 yrs. 8 mos.	.....	Measles.	Marked.	Coughed out on 4th day.	"	.....	Died 36 hours after tube was coughed out; pneumonia.	Dr. Lyttle.	Dr. Lyttle writes that intubation was a success as far as the relief of the stenosis was concerned.
25	3 yrs. 6 mos.	Tonsils and pharynx.	.....	Advanced.	Coughed out on 6th day.	"	Recovery.	.....	Dr. Neufeld.	Child not seen by Dr. Neufeld until patient was nearly moribund. Injected brandy and caffeine, and then intubated.
26	10½ months.	Tonsils, soft palate, and pharynx.	.....	"	4th day.	"	"	.....	Dr. Denhard assisting.	Pneumonia developed after 48 hours; temperature at highest, 105°; ran usual course, and patient recovered.
27	2 yrs. 10 mos.	Tonsils, pharynx, and soft palate.	.....	"	.....	"	.....	2 days later secondary croup.	Dr. Brothers assisting.	
28	3 years.	Membranes gangrenous.	Septic case.	"	.....	Partial.	.....	Sepsis.	Dr. J. Horn.	

TABLE OF CASES.—*Continued.*

Case.	Age.	Diphtheritic patches on	Complications.	Degree of stenosis.	Tube removed.	Relief to dyspnoea.	Recovery.	Cause of Death.	Operator, Dr. F. Huber.	Remarks.
29	4 yrs. 6 mos.	Tonsils and pharynx.	Pneumonia.	Advanced.	6th day.	Complete.	Recovery.	.....	Dr. F. Nordeman, Dr. Brothers assisting.	Prognosis extremely unfavorable in this case. Intubated, with a view to enthanasia.
30	2 years.	Membrane coughed up.	.....	"	.....	"	.....	.....	Dr. J. Horn.	
31	11 months.	Membrane coughed up.	.....	"	8th day.	"	Recovery.	.....	Dr. Teschner.	An older child sick with laryngeal stenosis at same time, but symptoms were not sufficiently urgent to require intubation.
32	13 months.	Tonsils and palate.	Pneumonia.	"	.....	"	.....	Exhaustion 2½ days after.	Dr. Neufeld.	
33	9 months.	.....	Measles.	"	.....	"	.....	Exhaustion 6 hours after.	"	
34	2 yrs. 6 mos.	Nares.	Measles week ago.	"	.....	"	Recovery.	.....	Dr. Brothers.	Tube removed on 5th day; 1 hour later Dr. Brothers re-intubated because of recurrence of stenosis, using small tube; 36 hours later it was coughed up and not necessary to insert again.
35	7 years.	Tonsils and pharynx.	.....	"	Coughed up after 64 hours.	"	"	.....	Dr. H. F. Nordeman.	Intubation easily accomplished. Shreds of membrane, etc., coughed up; still respiration is somewhat obstructed, and it was evident that membrane had been forced down. Tracheotomy not allowed, and no forceps accessible. Gave pure brandy (3j.), causing severe paroxysm of cough, with expulsion of tube and large piece of membrane. Intubated again; relief complete.
36	3 yrs. 6 mos.	Nares and pharynx.	.....	"	.....	"	.....	Secondary croup 2 days later.	Dr. Neufeld.	
37	18 months.	Membrane coughed up.	.....	"	.....	"	.....	Heart-failure 18 hours later.	Dr. Denhard assisting.	
38	18 months.	Nares and fauces.	.....	"	Coughed up on 6th day.	"	.....	Convulsions 10 hours later.	Dr. D. Cook.	
39	9½ months.	No membrane visible; pieces coughed up.	.....	"	Removed on 7th day.	"	Recovery.	.....	Case of Dr. Neufeld, Dr. Denhard present.	
40	2 yrs. 6 mos.	Tonsils.	.....	"	.....	"	"	.....	Drs. Bennett and Neufeld.	
41	5 yrs. 6 mos.	Tonsils and pharynx.	.....	"	.....	"	.....	Died 6 days later.	Dr. Rottenburg.	
42	2 yrs. 9 mos.	Tonsils and nose.	.....	"	7th day.	"	.....	Died 2 days later of secondary croup.		
43	22 months.	Tonsils; membrane coughed up.	.....	"	6th day.	"	Recovery.	.....	Dr. Horn present.	
44	4 years.	Soft palate and tonsils.	.....	"	.....	"	"	.....	Dr. Horn present.	Referred to me for intubation by Dr. F. Nordeman.
45	3 years.	Tonsils and palate.	Pneumonia.	"	.....	"	.....	2 days later secondary croup and pneumonia.	Dr. Brothers present.	Referred to me by Dr. Lyttle.
46	11 months.	Membrane coughed up.	.....	"	.....	"	.....	Pneumonia and secondary croup 2½ days later.	Dr. H. G. Lyttle.	
47	4 yrs. 6 mos.	Pharynx, etc.	.....	"	.....	"	.....	Died 3 days later of secondary croup.		

RÉSUMÉ OF CASES.

Under three years of age.				Three years of age and over.			
Age.	No.	Recov- ery.	Death.	Age.	No.	Recov- ery.	Death.
8 months....	1	0	1	3 years....	6	2	4
9 months....	1	0	1	3½ years...	2	1	1
9½ months...	1	1	0	3¾ years..	1	0	1
10½ months..	1	1	0	4 years....	3	2	1
11 months...	4	2	2	4½ years...	3	2	1
1 year.....	2	1	1	5½ years...	1	0	1
13 months...	1	0	1	6 years....	1	1	0
1½ year.....	1	0	1	7 years....	1	1	0
1½ year.....	4	0	4				
2 years....	5	2	3				
2½ years....	4	2	2				
2¾ years...	4	2	2				
Total....	29	11	18	Total....	18	9	9

Twenty-nine were under three years of age, 11 recoveries; 18 were three years old or over, 9 recoveries. Other points of interest will be developed later on.

cords, but just above them on the ventricular bands. There is not any ulceration of the cords, but slight ulceration may be produced by the head and lower end of the tube, when retained for a long time." This does no harm.

7. May give rise to difficulty in swallowing. Discussed further on.

8. Dr. Hance reports two cases in which there was sudden and complete cessation of respiration, due to excessive secretion of mucus and falling back of tongue, forcing epiglottis over the fenestra of the tube. Relief was afforded by depressing tongue and forcing it forward, in order to remove mucus from throat.

Accidents possible in extraction.—1. May be forced down into trachea. This occurred in Dr. Eichberg's case, the tube being of the old pattern, and necessitated tracheotomy for its removal. No danger of this accident with the latest style of tube.

2. Tube may be firmly fixed by swollen fold of mucous membrane of epiglottis or ary-epiglottic folds (œdematous);

pushing it aside by finger made removal possible (Caillé). Similar condition found at autopsy in one of Dillon-Brown's cases (THE MEDICAL RECORD, April 10, 1886).

3. Possible aspiration of food into bronchi during vomiting while extraction is attempted. Occurred in one of my cases, the little patient having eaten a very hearty meal shortly before. Did no harm in this case. Would advise, however, that but little nourishment be allowed for several hours prior to extracting tube.

In extracting, try to sink the forceps deeply into the tube and thus secure a firm hold, otherwise they may slip as the handle of the extractor is carried downward. It is well, therefore, to keep the left index-finger in contact with the shoulder of the tube, so that its removal may be accomplished by the finger if the forceps slip after the tube has been raised out of the larynx (the child being inclined forward at same time).

Removal of tube.—1. The tube may be removed as early as the fourth, fifth, or sixth day; exceptionally it may be necessary to allow it to remain ten or eleven days. O'Dwyer's tube can be dispensed with much more readily and earlier than the tracheotomy-tube. This is due to the fact that more or less membrane is detached from the larynx when the tube is introduced.

2. The frequent forcible and explosive cough assists in dislodging and expelling mucus and shreds of membrane.

3. The presence of the tube must of necessity cause more or less disintegration of the false membrane with which it is in contact.

4. When an intubation-tube is in position reflex spasm can no longer take place—the diseased structures are kept apart and *at rest*.

I do not forget that after a tracheotomy the membrane below the opening, even though recent, is apt to be expelled as soon as the trachea is opened or the tube inserted; that upon the vocal cords and in the larynx—and

here is the point—is not thrown off for from six to sixteen days or more in a patient upon whom tracheotomy has been done. Though the greater amount of air enters the lung through the tracheal cannula, some air passes through the larynx and alongside the tracheotomy-tube ; the laryngeal structures are more or less active, and are not as quiet as when separated by the intubation-tube.

5. Granulations are of frequent occurrence after tracheotomy, and require to be removed before the cannula can be dispensed with. They do not form after intubation ; if ulceration be produced, the ulcers are superficial and soon heal.

As long as the respiration is obstructed and expectoration free, there is no occasion for the removal of the tube until five or six days have elapsed. If, during this period, the breathing becomes noisy and does not become quiet after the subsidence of a paroxysm of cough purposely induced by the ingestion of lime-water, etc., or if it be suspected that membrane be loose, and there is danger of obstruction, the tube ought to be taken out, to permit removal of the obstacle, and then reintroduced, if necessary.

I do not favor its frequent removal, nor is it necessary for the purpose of allowing the patient to take nourishment. It is safer and easier to insert the stomach-tube, through the mouth or nares, and thus nourish the child. We must not forget the danger of crowding membrane down in the reintroduction of tube.

When diphtheritic patches are visible upon the tonsils, pharynx, or in the nose, I generally wait until they disappear before the intubation-tube is permanently removed. No membranes being present in the fauces, it is well to remove the tube at the end of five or six days ; if the dyspnœa return, the tube can be reintroduced at once or after the lapse of a few hours. The hoarseness and aphonia which persist when tube is removed yield to general treatment in from one to three weeks.

The *prognosis* in intubation (and this applies to tra-

cheotomy as well) is better when the evidences of general infection are mild or wanting; when the operation is done in cases in which the symptoms of asphyxia predominate, and the local lesion—the membranous deposits in the larynx—constitute the main danger to the patient. It is unfortunately true that in many instances it is not always possible, amid an aggregate of symptoms, often very complex, to distinguish perfectly the symptoms due to the local trouble in the larynx and those due to the sepsis or other complication. In view of the simplicity of the procedure and the comparative ease and rapidity with which it can be done, I have often intubated (the stenosis being sufficiently well marked to warrant it) regardless of the tender age and no matter how hopeless the cases from septic or other complication, the object being to allow the child to breathe more easily and to render its condition more comfortable, to prevent asphyxia with its struggles and suffering.

No positive prognosis can be given until forty-eight hours at least have elapsed. Though the dyspnoea be relieved, the membrane may extend downward, pneumonia set in, cardiac failure occur, systemic infection take place, and paralysis, nephritis, or heart-clot render the prognosis bad. If no marked elevation of temperature occurs and the respirations do not become accelerated during the first two or three days, the case will probably pursue a favorable course. Exceptionally a nephritis or late pneumonia will cause a fatal termination after the fifth or sixth day.

Treatment.—Intubation relieves the stenosis and keeps the larynx patent, so that air can gain free access to the lungs. It is thus a symptomatic expedient, so to say, resorted to, not with a view to cure the disease itself, but rather to overcome the obstruction to respiration. This should not be forgotten. We still have to deal with a serious disease and must meet other indications as they arise. What medicines are to be given? Dr. Northrup answers, "Milk and whiskey." He further adds: "I have

occasionally found my tubes well corroded when enthusiasts in bichloride treatment and advocates of iron have been hard to manage." At the risk of corroding my tubes and being included among the "enthusiasts," I would state that I continue the use of the "bichloride" throughout the disease.¹

If there be extensive diphtheria of the fauces, iron and chlorate of potash are indicated. If the nares be involved, nasal injections are resorted to. If other symptoms arise, the appropriate remedies are prescribed. In cases of threatened heart-failure, hypodermics of brandy, ether, camphor, caffeine, etc., may be employed. High temperature is treated by antipyretics either by mouth or suppositories.

By means of Spencer's steam atomizer, steam is kept up continuously. Alcoholic and other stimulants are not to be neglected.

Alimentation is of primary importance in this as in any other severe affection. Disgust for every article of diet is a very unfavorable symptom. As a rule the little patients will not take food well from parents or friends, and whenever possible it is advisable to insist upon the presence of a good nurse. Even then personal supervision should be exercised, and precise directions left; too much latitude should not be given, or much left to the discretion of the attendant not familiar with the requirements of the case. The proper preparation of the food ought to be looked into by the physician. I have frequently been told that it was impossible to administer

¹ The deductions of Thallon (New York Medical Journal, April 12 and 19, 1884) prove not only that the bichloride is a proper antifermentative, but also that the doses must be larger than usually recommended. Following the teachings of Jacobi (THE MEDICAL RECORD, May, 1884), I have kept these patients under the influence of mercury. From one-sixth to one-half and even a grain (according to the urgency of the symptoms and age of child) may be given in divided doses in twenty-four hours, and continued for a number of days without producing any untoward results. The medicine is continued even after intubation; and when the difficulty in swallowing is great, tablet triturates of bichloride, one-fortieth of a grain, are powdered and mixed with a small amount of sugar and placed dry upon the tongue, ice being given at the same time to facilitate solution and prevent the drug reaching the stomach in too concentrated form.

anything to the child. Sitting down by the bedside and personally attending to the feeding, I have been able to make the child take a reasonable amount of nourishment, either by threats of punishment, insertion of gag, force, or bribery. Trousseau very truly says: "There are no rigid rules in respect to the choice of food. We are often obliged, in some individuals, to satisfy the strangest possible caprices of taste." Some five years ago I performed a tracheotomy in a case of whooping-cough complicated with membranous laryngitis. Cyanosis was so far advanced that the operation was practically done without an anæsthetic. The boy, of Russian-Polish parentage, absolutely refused milk, stimulants, and usual articles of diet. Any attempt to force him would provoke him to such an extent that he would tear his hair, toss about wildly, and have a severe paroxysm of cough, often bringing up considerable quantities of blood. I was finally compelled to allow him to have his own way and to permit him to select his own dietary, his favorite dish being a compound composed of dried pears, carrots, potatoes, and meat stewed together. Of this he would eat two or three heaping soup-platefuls daily. The boy recovered. I mention this case, which is exceptional, merely to show that rigid rules cannot always be carried out, and in rare instances a departure from well-established precepts may not be attended by any untoward consequences. If after repeated attempts to give proper food I fail, I do not hesitate to allow the little fellow full latitude as regards his diet, provided rectal feeding be not possible and a resort to the use of the stomach-tube (through nose or mouth) be attended by marked prostration.

For several hours after the tube has been introduced nothing should be allowed but small pieces of ice dipped in brandy or wine. These will be readily taken and will not induce coughing to any extent. At the next visit (three to four hours later) the physician should make it a rule to endeavor to discover how much fluid can safely

be allowed at a time. Solids and semi-solids will be swallowed without much difficulty. Fluids, however, provoke considerable coughing. We must remember that the epiglottis is only an accessory to the closure of the larynx, and that the other more important factor, the action of its constrictor muscles, is prevented by the presence of the cannula; it is therefore evident that the deglutition of fluids can never be perfect with any form of tube in the glottis. If the head of the tube be too large, or ride too high in the larynx, the difficulty is greater.

It is my practice to sit by the bedside and endeavor to discover the idiosyncrasy of the little patient as regards the ability to swallow fluids. I begin with a teaspoonful of brandy and milk; if this be swallowed well, the nourishment is continued in teaspoonful doses, or larger amounts if well tolerated. If much cough follow, the quantity is diminished; in some instances but ten to twenty drops can be taken, and are then to be given by means of a medicine-dropper. This frequently happens in very young children, in such under eighteen months. In the case of older children we may allow them to sit up and take their food slowly from a cup or spoon—in fact, permit them to feed themselves as much as possible.

Medicines may be administered in the same manner. It is far preferable to gauge the patient's ability to swallow than to allow him to take indefinite amounts, which are coughed up as soon as taken, and only tend to add to the discouragement and torment of the little one. Solids and semi-solids are better taken than liquid when there is pain and difficulty in deglutition, as they do not provoke coughing to the same extent. Thick soups, farinaceous food with milk, chocolate, cream, soft-boiled or scrambled eggs, frozen or condensed milk undiluted, may be allowed. Ice-cream, water-ice, and jellies of various kinds, with or without wine or brandy, may be tried. To children a year or so of age I have given rice, barley, or oatmeal water, cooked thick and strained, with

white of egg and milk, a little salt and sugar being added to make it more palatable.

Rectal nutrient injections I have used in one or two cases; in only one case was I compelled to use the stomach tube (Davidson syringe and Jacque's catheter).

Dr. Caillé and others, in order to lessen the dangers of pneumonia or pulmonary complications from the possible entrance of food into the trachea, advise rectal alimentation or feeding by the stomach-tube (*THE MEDICAL RECORD*, March 19, 1887).

This, in my opinion, is going too far. If the hints thrown out above are followed, I do not think that feeding by mouth will add materially to the danger of pneumonia in this class of cases. Furthermore, we must remember that pneumonia complicating diphtheritic laryngitis is a rather frequent occurrence and is usually a broncho-pneumonia and results from rarefaction of the air in the respiratory passages during the period of impeded respiration, with consequent collapse of pulmonary tissue and dilatation of blood-vessels, and hence a disturbance of the circulation. . . . Lobular pneumonia will result from the aspiration of pieces of membrane into the smallest bronchi. . . . Second form of pneumonia is from the beginning of a fibrinous character (Jacobi). The danger exists, I admit, but is greatly exaggerated, and I have not been able to find the records of a single case in which, at the autopsy, the pulmonary inflammation was found to be due to the aspiration of particles of food into the bronchi after intubation.

In the first few cases Dr. Denhard, misinterpreting the directions, inserted the tubes so that the bevel of the flange looked upward and forward, and in these instances the curious fact was observed that the patients could swallow very well. A number of gentlemen in Chicago have had a similar experience, and the reversed position is preferred by many, among them Professor Hoadley. The latter maintains that the flange of the tube, as placed by him deeply in the vestibule of the larynx, in no wise

interferes with the functions of the epiglottis or the ary-epiglottic fold. Its removal, however, is attended with considerable difficulty. In order to test this further Dr. Denhard has lately introduced the tube in the reversed position and the patient was able to swallow with facility and comfort.

In this connection it may be well to refer to Dr. Waxham's modification of O'Dwyer's tubes, devised to overcome the difficulty of nourishing the patient. They are made with smaller heads and are provided with a rubber collar with an artificial epiglottis attached. The collar projects sufficiently to prevent the tube slipping into the trachea, and being more elastic, fits more perfectly into the larynx than the large metallic heads. When the child swallows, the epiglottis presses the artificial epiglottis down, so as to completely cover the aperture of the tube. As deglutition ceases the larynx falls and the elasticity of the rubber throws the artificial epiglottis upward. Even with this addition the deglutition of liquids is not perfect; some enters the larynx.

The pertinent question has been asked, Does intubation leave the patient without any of the advantages offered by tracheotomy?

In my experience and that of others who have given the new plan a faithful trial, intubation secures to the patient every advantage afforded by incision of the trachea. The insertion of an O'Dwyer's tube relieves the stenosis as promptly, thoroughly, and efficiently as tracheotomy. Expectoration is more readily accomplished after intubation, for the ability to close the glottis is preserved, the cough consequently is explosive and full, and the mucus and shreds of membrane are readily brought up.

Furthermore, intubation will save many lives in cases in which tracheotomy would not be permitted; it will save many a patient from the need of tracheotomy; and "finally, it will save many that could not be saved by tracheotomy." The last applies particularly to children

under three years of age. Fifty-two of Waxham's cases (up to December 14, 1886) were three years or under, a great many nursing infants, with 13 recoveries (twenty-five per cent.). Among the recoveries were 1 nine months old, others respectively, fourteen months, eighteen months, and twenty-two months of age (*Med. News*, January 1, 1887).

My own cases comprise 29 under three years of age with 11 recoveries, including one nine and one-half months old, one ten and one-half months, two eleven months, and one one year old.

I have endeavored, to the best of my ability, to bring before you a faithful view of the subject under consideration, to give the dark as well as the light sides, to present the advantages as well as the imperfections of the measure. The picture may be rose-colored, but my experience warrants the favorable and even enthusiastic view I have taken. I have seen child after child die of laryngeal obstruction in instances where tracheotomy was objected to, and of twelve cases in which I have operated, ten have died. I have furthermore assisted at the operation and more or less closely followed the after treatment of at least a score of cases in the practice of various friends. The results have not been brilliant or encouraging. It is thus evident that I do not reject the cutting operation upon theoretical grounds or insufficient experience. I appreciate the relief afforded by tracheotomy and have urged its performance in spite of discouraging results. Intubation affords relief as effectually and as thoroughly as tracheotomy. Moreover, it is a simpler and safer method. "The child is swathed, the gag is in, the tube is in, the thread is out, the gag is out, and the relieved and bewildered child is looking about, coughing, quite unable to comprehend the surroundings." Those who have witnessed the operation of intubation recognize the truth of the above and appreciate the benefits and advantages as well as the simplicity of the procedure. Many authorities, without any familiarity with the meas-

ure and without a proper study of the subject, condemn the plan and attempt to discredit the assertions of its advocates. The objections are theoretical.

Edmund Owens ("Year-Book of Treatment for 1886," page 164) concedes that he "neither has nor desires a practical acquaintance with it," and yet condemns the method. Michael, of Hamburg, says the method is as dangerous as it is impracticable. Thus far it has not met with much favor in England or on the continent.

In concluding, it is but just that we acknowledge the debt of gratitude we owe to our *confrère*, Dr. Joseph O'Dwyer, considered by Jacobi the most deserving and most modest of all men. The patient, painstaking, and unostentatious manner in which he has conducted his experiments and investigations deserve due recognition at our hands. The perseverance, ingenuity, and originality shown in perfecting the method merit our admiration. The disinterestedness, candor, and modesty, so characteristic of the man, and which stamp his references to this invaluable addition to our resources in the treatment of croup, cannot be extolled too highly, and deserve more than mere praise or words of fulsome flattery. Finally, I heartily indorse the sentiment expressed by Dr. Ingals and join "in acknowledging the nobleness of the profession at large which tolerates no secret method, but generously donates to mankind every improvement in the healing art." Among the latest, but not the least, may be classed intubation, rightly considered as "one of the great advances in this age of medical discoveries."

FEEDING AFTER INTUBATION OF THE LARYNX.

WITH EXHIBITION OF TUBES MODIFIED TO OVERCOME DIFFICULTY IN FEEDING.

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FROM the very beginning of my experience with intubation I recognized the fact that the greatest objection to this operation, and the one most difficult to overcome, was that of feeding the child while the tube remained in the larynx. I therefore began very early to try various modifications in the size and shape of the heads of the tubes with a view to remedying this defect. I will show you a few of these modifications in the order in which they were made.

1. I first had the tube made with a very small shoulder which rested on the vocal cords, while the lateral portions of the flange occupied the ventricles, thus permitting some action of the constrictors, such as occurs under normal conditions, to aid the epiglottis in protecting the larynx during the act of deglutition. The objection I found to these small-headed tubes was the tendency of the swollen tissues to close over the aperture above, and there was also the danger that the tube might be pushed through into the trachea during attempts at extraction.

2. My next modification consisted in gradually increasing the size of the head and giving the upper portion of the tube a backward curve in order to carry it away from the base of the epiglottis, at which point the straight one frequently produced ulceration.

3. The posterior portion of the tube was made longer than the anterior, or oblique from before backward and upward, in order to allow the epiglottis to come in contact with it sooner and with greater force when pressed down by the base of the tongue.

4. The next modification was to increase the size of the head so as to make it fill the cavity of the larynx and thus prevent the entrance of fluids around it, for cough will be excited by contact of a foreign body with any portion of the mucous membrane of the glottis. The heads of the tubes now made are much larger than is necessary, but as deglutition, if no better, is certainly no worse, I have not changed them for the reason that the large head renders the extraction less difficult.

5. The head of the tube was now made concave on its upper surface. This shape was suggested by taking a wax cast of the larynx and pressing the epiglottis over it while the wax was still soft. The impression made on the wax was similar in shape to that which you see in this tube. I have used this modification in a few cases, but without witnessing any apparent improvement in deglutition. Should it not prove otherwise objectionable on a more extended trial, this form of head may be an advantage, as it would render the removal of the tube, which is now the more difficult operation, much easier than its introduction, for the extraction, striking anywhere on the concave surface, would naturally and easily glide into the aperture.

6. In some cases a double backward curve has been given to the upper portion of the tube, the first curve being covered by the flange and the second being a little lower down. This has been used in several cases, but I have not seen any improvement in deglutition to result therefrom.

This shape is advantageous, however, in one respect. Autopsies were made in three cases in which these modified tubes were used, and not the least abrasion was found on the anterior wall of the trachea, at the point

corresponding to the lower extremity of the tube, where more or less ulceration is not uncommonly produced by the tubes ordinarily used. This ulceration is sometimes quite marked in cases in which the vital powers have been much reduced by a previous attack of scarlet fever or measles or both, and is produced in the following manner: A tube in the larynx acts as a lever, with the posterior commissure as a fulcrum. During every act of deglutition the epiglottis presses the upper short arm of the lever backward and tilts the lower long arm forward against the wall of the trachea. First, the pseudo-membrane disappears for about one-fourth of an inch above and below the end of the tube. I have seen many cases in which this alone occurred, and others in which the lesion varied from simple loss of the epithelium to pretty extensive ulceration. Several years ago, when I was using short tubes, from one to one and one-half inch in length, and of larger calibre, I never found ulceration in the trachea, but this lesion was present in almost every case just below the vocal cords in the subglottic division of the larynx.

I also show you one of Dr. Waxham's modified tubes with rubber epiglottis, which I have not yet tried.

With all these modifications, and others that I have not mentioned, I have found about the same difficulty in the swallowing of fluids, some of which, when compressed by the muscles of deglutition, will be forced under the epiglottis, no matter how accurately it covers the aperture of the tube.

There are still other modifications that I intend to try, and as other men are working in the same line, there is reason to hope that some device will yet be found to overcome this difficulty.

Solids and semi-solids, when there is an appetite for such food, and when the patients can be induced to take it, are swallowed much better than fluids and do not enter the tube, as far as I am aware. Indeed, there is no reason why they should do so, for a bolus of food as

it passes downward tends rather to press the epiglottis more firmly over the mouth of the tube than to raise it, as happens in the case of fluids. I make an exception to this statement in the case of malignant diphtheria of the larynx, a few cases of which I have operated upon, in which the epiglottis is converted into a mass of an almost globular shape by reason of the infiltration into its tissues, whereby its normal functions are completely abolished.

Some children swallow remarkably well after intubation, others very imperfectly, while a few refuse absolutely to swallow anything. This difference is to be explained partly by the condition of the epiglottis, whether very much swollen or not, and partly by the absence or presence of a desire for food. I have often known children to refuse milk or any other kind of nourishment, when they would drink water, beer, or anything that they liked, with very little difficulty. On several occasions I have removed the tube for the purpose of giving nourishment, but found that the patients could not be induced to take food any better than before. This occurs more frequently in cases of severe complicating nephritis which occasions nausea and a loathing of food.

There is sometimes an apparent improvement in swallowing after intubation, and more nourishment is taken than before the operation. This is due to the relief of the dyspnœa, which, before the insertion of the tube, was so urgent that the little sufferer could not afford the loss of the one or two respirations that would be necessitated by making a single act of deglutition. As a rule, the longer the tube remains in the larynx the better the patient learns how to swallow. I have observed this in adults as well as in children. One woman declared after intubation that she could not swallow anything in either solid or liquid form, and it was necessary to feed her by the stomach-tube. After the laryngeal tube had been retained for two or three weeks she took as much food

as the stomach would tolerate, and, in addition, large doses of iodide of potassium.

Exceptions to this rule are found in those cases in which, before intubation, nourishment was refused because of the painful condition of the pharynx, or because of anorexia induced by nephritis, and in others in which a great deal of pain and irritation, caused by ulceration on the anterior wall of the trachea, previously alluded to, are present.

I always instruct children who are old enough to understand, to drink as rapidly as they can and then cough to expel any fluid that may have entered the tube, instead of coughing after each deglutition as they usually do. In quite a number of cases I have been obliged to supplement feeding by the mouth by rectal alimentation, with or without stimulants, as indicated. In only a few have I had to resort to the stomach-tube.

Intimately connected with the question of feeding after intubation is that of food-pneumonia, so much talked about of late. I will first refer briefly to the most important factors concerned in the causation of pneumonia as a complication of croup, and will then give some reasons for believing that food is not one of them. The several etiological factors may be grouped as follows:

1. The presence of secretion in the lower air-passages, in consequence of the frequent association of bronchial catarrh and croup.

2. The excessive amount of blood drawn to the lungs when there is sufficient obstruction in the larynx to prevent the free ingress of air required to fill the vacuum produced by the inspiratory expansion of the chest.

3. Atelectasis from the same cause or from plugging of some of the bronchi by pseudo-membrane.

4. The presence of a tube, whether it be in the larynx or in the trachea, not because it may admit a little of the milk or other fluids swallowed, but because it prevents closure of the glottis, and consequently prevents

that compression of the air which is essential in order to give full expulsive power to the cough. The irritating secretions, therefore, instead of being promptly expectorated, accumulate, and are aspirated into the air-cells, where they sooner or later excite inflammatory changes.

When we consider the nature of these influences, some of which are constantly present in severe cases, it ought not to be surprising to find pneumonia, especially of the lobular form, a rather frequent complication of croup. And this is particularly so after operation, whether by tracheotomy or intubation.

As opposed to the food-pneumonia theory, I offer the following :

1. I do not believe, and there is no evidence, so far, to prove, that any of the fluid entering the tube ever reaches the bronchi, for it is promptly expelled by coughing.

2. Those cases in which the croupous process does not invade the bronchi, and in which there is little or no bronchial catarrh, no matter how imperfectly they swallow, rarely, if ever, develop pneumonia.

3. Intubation in chronic stenosis of the larynx, in the adult, is not followed by any inflammatory changes in the lungs. In one case of this kind I have already introduced a tube over fifty times, leaving it in the larynx on several occasions as long as a week at a time. This patient, owing partly to a deformity of the epiglottis, swallowed both solids and liquids very imperfectly, but never developed even the slightest amount of bronchitis. Another female patient, who had worn a tracheal cannula for over two years and who was in failing health and suffering from bronchitis at the time that she was intubated, rapidly improved after the tube was inserted into her larynx, and the external wound was closed. The bronchitis also disappeared within a reasonable time. This patient wore the tube in her larynx continuously for over ten months, and enjoyed excellent health during the entire time.

There is no objection to the use of emetics, if indi-

cated, after intubation, and there is no danger that the vomited matters will enter the tube, as no resistance is offered to their escape from the œsophagus, such as must be overcome when food or drink enters this canal from the pharynx

Finally, I wish to show you two hard-rubber tubes which are suitable for use in any form of acute stenosis of the larynx in the adult. The larger is intended for a large adult male, the smaller for a small-sized or young adult male, or for a female. Whether they will be any improvement on the metal tubes that I have been using remains to be settled by a more extended trial. I have used the smaller of these in two women, who had previously worn metal tubes of a much smaller calibre. One of the patients expressed a decided preference for the heavy tube, which, she said, sank deeper in the larynx and enabled her to swallow more easily than did the light-rubber tube. But although one weighed one ounce and three-quarters and the other only one hundred grains, she could not appreciate any difference in the weight as it was in position in the larynx. The other patient, while she could not swallow as well with it, was equally strong in her preference for the lighter tube, saying that it gave her less pain and irritation, and enabled her to expectorate more easily. These tubes are made by Tiemann & Co.

PATHOLOGICAL ANATOMY OF THE RESPIRATORY TRACT AFTER DEATH FROM LARYNGEAL DIPHTHERIA AND INTUBATION.¹

By W. P. NORTHRUP, M.D.,

PATHOLOGIST TO THE NEW YORK FOUNDLING ASYLUM.

IN my paper read before this Academy in December last (see MEDICAL RECORD of December 11, 1886), entitled "Laryngeal Diphtheria, Intubation, and Pathological Anatomy," etc., I analyzed the cases found in the post-mortem records of the New York Foundling Asylum. There were at that time 87 cases recorded of death from laryngeal diphtheria.

Of these, 50 were males, 37 females. Average age was two years and seven months. Number of children dying under one year, 13; between one and two was 9; two and three, 10; three and four, 36; four and five, 11; five and six, 1; six and seven, 1; unknown, 6—total, 87 cases.

"The greatest mortality, as we see, was from three to four years of age, where we find 36 of the 87 cases. The next number falls abruptly to 13, representing those dying under one year."

In 56 the diphtheria began in the larynx. Of the 87 cases 22 followed measles, 8 followed scarlet fever. In 54 cases there was pneumonia, the diagnosis of which was made either from obvious signs of consolidation, or, where this was not well developed, from the microscopic findings. Not in all cases did there seem to be enough pneumonia to be the cause of death. In 29 cases there

¹ Read before the New York Academy of Medicine, June 2, 1887.

was estimated to be enough. In 27 cases bronchial diphtheria was the prominent lesion. I will here repeat that I do not rule out pneumonia, because lung inflates easily by artificial means and returns nearly to its normal color. I am not willing to admit that it is collapse, and not pneumonia, on that test. In cases of doubt the microscope has been used to determine the nature and extent of the lesion, and in the records referred to the diagnosis heading the history and post-mortem records has been made on the anatomical basis.

Since January 1, 1887, there have been added to these records 20 cases, making in all 107. These will be interesting and instructive, because they are all cases of laryngeal diphtheria occurring in a fatal epidemic of measles. Of the 20 cases all had measles and pneumonia; 8 had scarlet fever with measles; and 13 had, in addition, well-marked nephritis. These points are mentioned to show the severity of the epidemic, which in four months has added 20 cases to the former record.

I said in my paper that I had never found any ulcers of the trachea which were more than a rubbing away of the epithelium. I have this evening to show you the lesions of a severe epidemic, in which the patients have been overwhelmed with scarlet fever and measles and pneumonia and nephritis and diphtheria. On these glass slides are shown the ulcers in gross, from four tracheas, which ulcers, you will see, extend in depth to the rings of the trachea, laying them bare. The lower end of the tube, at each movement of swallowing, rubs against the anterior wall of the trachea. In this severely fatal epidemic we find what we did not in previous cases, viz., deep ulcers. Of the 20 cases 5 had tracheal ulcers deep enough to be of serious moment. I have never seen ulcers made by the head of the tube worthy of consideration. It amounts simply to necrosis of the epithelium, and will heal without contraction.

One of the first questions to be asked is whether or not milk, which occasions cough, passes into the finer bron-

chi and alveoli and causes pneumonia—foreign-body pneumonia, aspiration pneumonia, *schluck pneumonie*. I may answer, briefly, I have never found any evidence that it did find its way into the finer bronchi. I am familiar, too, with the article of Orth, of Göttingen, recently published, and I find nothing corresponding to his description.

I am endeavoring by experiment to determine how far the fluid passes downward into the air-passages. Fluid bathing simply the under surface of the epiglottis may cause violent cough. The experiments are in this line. By some means register the depth to which the fluid descends, either by harmless staining-fluids or by finely divided carbon suspended in milk. Thus far I have no results to publish.

This paper has but two points to add to that of December on this particular feature of the discussion.

First, after all that has been suggested on the subject, I find no evidence that milk, or food of any kind, has passed into the finer bronchi and alveoli of patients wearing the laryngeal tube.

Second, that in patients the subjects of previous exhausting disease the lower end of the tube may cause ulceration, even when worn the usual number of days. This ulceration may easily amount to a complication.

CONTRIBUTION TO THE DISCUSSION ON INTUBATION OF THE LARYNX.¹

By A. CAILLÉ, M.D.,

NEW YORK.

I WISH to state at the onset that we cannot this evening speak a final word as to the actual merits of intubation.

It is true that a large number of cases are on record, but it is equally true that many of these cases are reported in a superficial manner, and therefore lose their value as statistical material.

I must confess that Dr. Huber and Dr. Brown have presented their cases in a manner calculated to inspire confidence in the conclusions which they formulated.

I believe, moreover, that it is a good plan for those who have had experience with both tracheotomy and intubation to come together occasionally and compare notes; and taking this view, I will briefly state my own experience.

I have done tracheotomy 21 times, with 5 recoveries. I have intubated 16 times, with 6 recoveries. Of the intubated cases 9 were cases of nasal or pharyngeal diphtheria and laryngeal stenosis, with 2 recoveries; 6 were cases of true membranous laryngitis, and no visible diphtheritic exudate on fauces, with 3 recoveries; 1 case was probably a severe simple inflammatory stenosis of five days' standing, which had not improved under ordinary treatment, with very urgent dyspnoea, 1 recovery.

Most of these cases were seen in consultation, and intubation was done rather late, and I am convinced that

¹ Read before the New York Academy of Medicine, June 2, 1887.

without active interference every one of these children, whose ages ranged from one to seven years, would have died of suffocation.

I believe that I would be able to report at least one more recovery if intubation had been done earlier in one case, for breathing had actually ceased and artificial respiration had to be practised.

My best results in intubation were obtained in cases of undoubted membranous laryngitis, in which diphtheria of fauces was not visible at the time of intubation.

Now this is quite the reverse of my experience with tracheotomy, for most of the children operated upon for true membranous laryngitis died from an extension of the membrane into the finer bronchi, and it made apparently no difference whether the trachea was incised above or below the thyroid gland. The cause of death in such patients as did not recover after intubation was, in the majority of cases, catarrhal pneumonia. In most of the fatal cases I gave some liquid nourishment, which may have provoked pulmonary inflammation through being aspirated. Of late, I have given only solids, chopped very fine and moistened, and small pieces of ice to quench thirst; since that time my results are much better.

One case deserves special attention. I intubated a child, one year old, with extreme stenosis but no visible diphtheria. I removed the tube every other day to feed the child, as it could not swallow, but I was obliged to reintroduce it. On the twelfth day I noticed pharyngeal and nasal diphtheria, and on the fourteenth day, the child died of exhaustion, with the tube *in situ* and the lungs free. If I were asked to express my personal opinion as to the value of intubation, I would say :

1. In *general practice* intubation is preferable to tracheotomy in urgent laryngeal stenosis of children in the majority of cases.

2. When pharyngeal or nasal diphtheria and laryngeal stenosis are present at the same time, intubation

should be practised in preference to tracheotomy, when the surrounding circumstances are such as to preclude the possibility of proper and intelligent after-treatment.

3. Tracheotomy is preferable to intubation in such cases of laryngeal stenosis, with pharyngeal or nasal diphtheria, which appear from experience *hopeless*, without *sufficient stimulation and nourishment* and proper local treatment of naso-pharynx, *provided the operation and after-treatment can be conducted under the most favorable surroundings*.

4. These conclusions pertain to intubation with the present style of tube.

DANGERS AND ACCIDENTS OF INTUBATION.

BY DILLON BROWN, M.D.,

NEW YORK.

THE accidents of intubation of the larynx are many, but the *unavoidable* accidents are few, and, with the exception of pushing down pseudo-membrane before the tube—which is a rare complication—they are not important. I shall discuss, *first*, those accidents which can be and should be avoided, due to lack of skill, carelessness, or imperfect instruments, and *second*, the unavoidable accidents, and *last*, some of the dangers of intubation, theoretical and practical.

Avoidable accidents.—1. Asphyxia from prolonged attempts at introduction.

2. False passages made in attempts at introduction. "

3. Asphyxia from slow accumulation of secretions in the tube.

4. Slipping of tube into the trachea.

5. Asphyxia from swelling over the head of the tube.

6. Passing the tube into the œsophagus.

7. Injuries to the larynx in attempts at removal.

8. Miscellaneous.

Unavoidable accidents.—9. Pushing down pseudo-membrane before the tube.

10. Fatal obstruction from fragments of membrane in or below the tube.

11. Coughing out of the tube.

Dangers, theoretical and practical.—12. Shock of the operation.

13. Inspired air being septic and causing pneumonia.

14. Food and liquids entering the bronchi.
15. Ulcerations due to the pressure of the tube.
16. Œdema, from various causes.
17. Dangers from applications by means of the tube.

Asphyxia from prolonged attempts at introduction.—

The tube, in most cases, should be inserted into the larynx quickly, and on the first trial. Every additional attempt and every prolonged one is harmful ; but there is less injury done by several short trials at introduction than by a single prolonged one, even if successful.

False passages made in attempts at introduction.—In cases of acute stenosis the tube slips easily into the larynx, and it requires no more force to push it well into position than it does to pass a sound through the healthy urethra. In the two cases which have come under my notice of false passages made in attempts at introduction, an unjustifiable amount of force was used to push the tube in place. In both of these, its insertion caused a complete cessation of respiration, which was supposed to be due to the pushing down before it of membrane. The autopsies, however, showed that in the first case the tube had entered one of the ventricles of the larynx, and was forced down through the surrounding tissues along the outside of the trachea. In the second case there was a rupture through the wall which separates the œsophagus and the trachea, and respiration was prevented by the pressure of the tube against this yielding membranous division.

Asphyxia from the slow accumulation of secretions in the tube.—In a certain proportion of cases, especially in those in which the patient is weak and coughs but seldom, and in which the amount of secretion is small, the tube gradually becomes lined, sufficiently to cause obstruction, with a mixture of what seems to be mucus and pus. Although this is not a common complication, and can be prevented to a great extent by the faithful use of the steam atomizer, it is well to be on our guard against it, and in all cases of secondary dyspnœa to re-

move the tube, and make sure that it contains no obstruction.

Slipping of the tube into the trachea.—This is an accident which, I believe, has never happened, and which, I believe, never can happen when a proper-sized tube is used, except as a result of injuries to the larynx made in attempts at removal. If the extractor is passed into the larynx, but outside of the tube, and is forcibly withdrawn with its blades widely open, great damage will be done to the larynx. It is possible in this manner to split open the cricoid cartilage, and so enlarge the opening of the glottis as to allow the head of a tube to slip through the larynx into the trachea. This is an accident which can always be avoided.

The occurrence of this accident has been reported three times, but it seems to me that a careful analysis of these reports will show that such has not been the case. It should be remembered that the head of the tube, even if pushed below both the ventricular bands and the true cords, will still remain in the larynx, being held by its narrow, sub-glottic division. Again, as the head of the tube is smaller than the calibre of the trachea, it would fall by its own weight until its lower end was arrested at the bifurcation or became lodged in a bronchus. Therefore, if this accident should happen, the tube could not be felt by the finger, and neither could it be grasped and removed by the extractor in the usual manner. In Dr. Waxham's case, after anæsthetizing the child, the tube was grasped by the extractor and removed without force in the usual way. He bases his diagnosis on the presence of a croupy cough and the ability to swallow easily. These symptoms would also appear if the head were retained in the sub-glottic division of the larynx. In Dr. Eichberg's first case an old-fashioned, small-headed tube was used, and it was pushed down in attempts at removal. Although the case is not reported minutely enough to state positively whether the head was in the sub-glottic division of the larynx or in the trachea, it

seems to me that the evidence would indicate the former place rather than the latter as its position. The diagnosis of its position was apparently based upon the fact that it had been pushed below the true cords, the retaining power of the sub-glottic portion of the larynx being ignored. After this an unsuccessful attempt was made to remove it, from which I inferred that it could be felt by the extractor. Again, the child's breathing was perfectly easy, and upon opening the trachea the head of the tube was found above this opening. In Dr. Eichberg's second case the tube, also one of the early ones, slipped through the chink of the glottis, and was therefore supposed to be in the trachea. Of the three cases reported, in one of them the head of the tube was not in the trachea; and in the other two, an old-fashioned, small-headed tube was used, and its position in the trachea was not demonstrated. When there is much swelling over the head of the tube, it may be erroneously supposed to have slipped below the cords.

Asphyxia from swelling over the head of the tube.—This is a complication easily overcome by inserting a tube with a larger head. It has occurred in two of my cases, and in the first one I did not recognize the cause of the secondary dyspnoea until the autopsy, after the child had died from asphyxia. It is a good plan, before removing the tube in cases of secondary dyspnoea, to exclude this accident, as its cause, by a digital examination of the larynx.

Passing the tube into the œsophagus.—There should be no difficulty in determining whether the tube is in the larynx or in the œsophagus, although this mistake has been made in two cases which have come under my notice; and in both of them the child died from asphyxia. After coughing up the tube, it has been swallowed several times, and in attempts at introduction it has been lost in the stomach a number of times. In all these cases its presence caused no trouble, and if the patient recovered, it was passed per rectum without difficulty.

In one case, where it was thought to have been swallowed, it was unexpectedly expelled from the larynx several days later, and in another case it was found in the pocket of one of the other children.

Injuries to the larynx in attempts at removal.—In removing the tube no force is required ; and in cases in which the extractor comes away with difficulty, it is because it is caught in the tissues of the larynx, and much injury will be done if it is forcibly removed with the blades widely open. Not only will you lacerate the larynx, but may even split open the cricoid cartilage, and so enlarge the chink of the glottis that on the next attempt to remove it you will push it into the trachea. This accident has happened in practice on the cadaver.

Miscellaneous.—At times, after the removal of the tube, there occurs a spasm of the glottis from the irritation of the inspired air upon the larynx, which has been protected so long. This can be avoided to a great degree by giving an opiate just before its removal, but it is always advisable, before removing the tube, to have everything prepared for its immediate reinsertion, if necessary. This rapid return of the dyspnœa may also be due to a diphtheritic paralysis of the abductors or to an œdema of the glottis. The string should be of strong braided silk, not only to prevent its breaking, but to prevent the more serious complication of its untwisting and catching in the eye of the tube, so that it cannot be withdrawn without removing the tube. The string should be cut as short as possible and withdrawn slowly to prevent its cutting the surrounding tissues. The lacerations made by the gag, and by the finger in locating the larynx, are unimportant.

Pushing down pseudo-membrane before the tube.—This is the gravest accident which the operator can encounter, but fortunately it is an extremely rare one. On the first introduction of the tube, sufficient membrane has been pushed down to cause asphyxia in only one of Dr. O'Dwyer's cases, and in two of my own. In each case

after withdrawing the tube, the obstruction was expelled and the dyspnoea relieved. Later, when the membrane has become more or less detached and broken down, upon the reintroduction of the tube, the liability to this accident is increased. In connection with this danger, one point regarding the introduction of the tube must be closely observed. The tube should be pushed well down in position, and held down by the finger while the obturator is being removed. Otherwise, when it is pushed into position after the removal of the obturator, the lower end is unprotected, and can easily strip off enough membrane to cause obstruction at that point. Upon the reintroduction of the tube I have pushed down sufficient membrane to cause obstruction in four cases, but in only one of these was it a fatal obstruction. This occurred eighteen days after the first intubation, and shows how long the membrane will sometimes persist.

Other accidents, and those avoidable ones, may be mistaken for this—*e.g.*, apnoea from prolonged attempts at introduction, pushing the tube through a ventricle of the larynx, and other false passages, etc.

Fatal obstruction from fragments of membrane in or below the tube.—This is also a rare accident, and it has not occurred in any of my cases. If the tube becomes obstructed, it will usually be expelled, and it is on this account that it is advisable to have it retained in the larynx as loosely as possible. Certainly, the number of deaths from clogging of the tube after intubation, as shown in the reported cases, compares in a remarkably favorable manner with the number of deaths from the same cause after tracheotomy.

Coughing out of the tube.—This is undoubtedly a source of danger, but it can be entirely obviated by making the retaining swell of the tube sufficiently large. It is intended by Dr. O'Dwyer that the tubes be held loosely in the larynx, so that when they are no longer needed, or become obstructed, they will be expelled. After being coughed out, if the dyspnoea does return, it is usually several hours before it becomes extreme, and

there is time to reach the patient and reinsert the tube. In my own practice I have had one death from laryngeal obstruction after coughing out of the tube. It was a boy fourteen months old. I removed the tube on the fifth day, but was compelled to reinsert it the next day. From this time the tube was frequently expelled, being retained from five to sixteen hours. I had a special tube made with a very large retaining swell, but it was apparently expelled as easily as the others. There was paralysis of the pharyngeal muscles, and of the external rectus of the eye, and it seems to me that the cause of the frequent expulsion was a paralysis of the muscles of the larynx. There was usually time to reach the child and reinsert the tube; but on the twenty-eighth day it was some time after the expulsion of the tube before I was sent for, and when I reached the patient two and one-half hours after it was coughed out, he was dead. I obtained the larynx, and there were no macroscopical appearances to account for the return of the obstruction.

Shock of the operation.—This is very slight when the operation is done quickly and skilfully. In a certain number of cases of laryngeal diphtheria, soon after intubation, the temperature begins to rise, and the condition of the patient rapidly grows worse. However, this occurs just as frequently after tracheotomy, and it does not occur after intubation of the larynx for stenosis due to other causes—*e.g.*, syphilitic stenosis or catarrhal croup. Therefore, it seems to me that this change is not due to the operation itself, but is the result of relieving the laryngeal obstruction, this acting in some manner as an antipyretic. We know that nitrogen acts as an antipyretic, and may not its action be due to its cutting off the supply of oxygen rather than to any effect of its own?

Inspired air being septic and causing pneumonia, and food and liquids entering the bronchi.—My experience has been that the cause of death, when due to pulmonary complications, is, in the vast majority of cases, not pneumonia, but an extension of the disease to the bronchi—a diphtheritic bronchitis. Again, pneumonia is not a

common complication of diphtheria when the larynx is not involved, although the same condition exists—the inspired air is septic. If the extension of the disease could be caused by this contaminated air, we would expect laryngeal or bronchial diphtheria to occur oftener, for in not one case of diphtheria out of ten is the larynx or the bronchi involved.

In no autopsy at the New York Foundling Asylum has food ever been found in the bronchi, and I believe that this is a theoretical danger rather than a real one.

Ulcerations due to the pressure of the tube.—That ulceration may originate in this way is without question, but this will be fully discussed in the paper on the pathology of the larynx after intubation. In none of the cases reported has the presence of the tube caused any harm. Certainly the tracheotomy tube does do injury, and it is not very rare to see cases of retained tracheal tubes due to granulations, incurvation of the wound, etc., and occasionally also death from hemorrhage following ulceration through a blood-vessel.

Edema of the larynx; local applications.—In cases of laryngeal diphtheria the stenosis is due not so much to the pseudo-membrane as to the swelling of the tissues beneath it. The pressure of the tube diminishes this swelling in a marked degree, besides hastening the disappearance of the membrane, if not even preventing its formation. This can be demonstrated at nearly every autopsy on cases dying after intubation. In making local applications by coating the tube with strong astringents, it is possible to cause an oedema of the glottis, which takes a long time to disappear. I lost one case from this cause, due to the too enthusiastic application of an ointment of nitrate of silver—3 ij. to $\frac{3}{4}$ j.—just after reviewing the works of Dr. Horace Green. An application made in this manner is not one of short duration, but extends over several hours, or even days. Lacerations made in attempts at insertion or removal may set up an oedema.

TRACHEOTOMY FOLLOWING INTUBATION OF THE LARYNX.¹

By IRWIN H. HANCE, M.D.,

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My object in writing this paper is to report in detail a case where tracheotomy was performed after the tube had failed to give relief in a child suffering from membranous croup and scarlatina.

The following is a history of the case : Alfred J——, aged twenty months. Father English ; mother Irish. Admitted to the hospital October 16, 1886. Nursed for eighteen months. Has had measles. Is well nourished, but pale. No glandular enlargement.

October 22d.—Appeared sick during day. Throat red. Slight elevation of temperature.

October 23d.—Well-marked diphtheritic patches on the tonsils.

October 24th.—In the morning was a little croupy ; continued with croupy cough during the day, and was vomited three times, the symptoms thus being relieved. Child has developed a well-marked scarlatinous eruption.

October 25th.—At 10.30 A.M. child was much worse, there being well-marked dyspnœa, with recession of chest-walls, cyanosis, and other signs of laryngeal stenosis. At 10.45 a tube was introduced (No. 2), and almost immediately coughed out, along with much thick mucus ; operation was again repeated with a like result. When the tube was introduced for the third time it became obstructed, and caused a serious embarrassment of breathing. It was removed at once, and there was almost

⁻¹ Read before the New York Academy of Medicine, June 2, 1887.

complete cessation of respiration, but artificial respiration revived the child in a few minutes.

Dr. Wheelock, the attending physician, then advised that laryngotomy should be performed if the next introduction of the tube failed to give relief. At 11.30 A.M. tube was reintroduced. At the end of ten minutes it was removed, and was found to be plugged with such thick mucus that almost a cast of the tube was formed. Cleansed and once more inserted ; this time the respirations improved for a short time.

At 12.10 P.M. respirations worse, tube coughed up. Rapid incision was made through the crico-thyroid membrane and the cricoid cartilage, affording the child immediate relief. Wound was held open by retractors and the trachea thoroughly cleansed from mucus. Small hard rubber tracheal tube introduced. From this time on there was not the least return of any dyspnoea.

At 7 P.M. child was quietly sleeping, breathing without any apparent effort. No cyanosis existed, and the scarlatinous eruption had entirely returned. Was able to take liquid food. Temperature during the night reached $106\frac{4}{5}^{\circ}$ F. Failed slowly and died at 8 A.M., October 26th, from the systemic poisoning of the two diseases.

Necropsy was held twenty-six hours after death by the pathologist, Dr. N. H. Henry. Rigor mortis absent. Marked post-mortem ecchymosis. An incision passes through crico-thyroid membrane and cricoid cartilage ; edges of wound are in a fair condition. Trachea shows an abundant fibrinous exudation, which is easily lifted from the surface. Lungs : Slight hypostatic congestion. Pericardium : Increase in the amount of pericardial fluid. Heart : Valves normal ; muscular tissue pale. Liver and spleen congested. Kidneys somewhat enlarged. Increased amount of cortical substance. Medullary portion very pale. Capsules easily separated. Brain not examined.

In reviewing the history of this case I may emphasize the statement that the tubes were given a thorough trial

and proved utterly useless. Now, what was the cause of this failure on the part of the tube to relieve the child's symptoms? It seems to me that two things conjoined to bring about this result, viz., an excess of thick, tenacious mucus in the trachea and a partial dislodgement of the false membrane by the introduction of the tube. The former was present to a marked degree, and we may safely assert that some membrane was dislodged, because on one occasion after the withdrawal of the tube, artificial respiration was required to restore the child's function of breathing. Was the operation of tracheotomy deferred longer than was necessary? At present, in view of my experience with this case, I think that on another like occasion I should resort to tracheotomy earlier, because many attempts at the introduction of a tube unquestionably cause a more or less decided depression of the child. The selection of the crico-thyroid membrane as the best place to incise the trachea was decided upon because of the ease and rapidity with which the operation could then be performed, one rapid incision being all that was required.

Would the child's chances of recovery have been better if tracheotomy had been performed at first without using the tubes?

This is an extremely difficult question to answer; I can only say that tracheotomy in children under two years of age terminates fatally in a very large percentage of cases, and that intubation gives a fair showing. From my own experience I feel that intubation in such young children gives equally as good results as tracheotomy.

Thus far I have considered only my own case; I ask your attention now to a few other cases which have been reported in the medical papers.

Dr. Ferguson,¹ of Troy, reports a case similar to mine, in which the tube detached a piece of membrane. Tracheotomy was performed; the result was a complete

¹ New York Medical Journal, March 5, 1887, vol. 45, No. 10, p. 273.

relief to the dyspnœa, although the child died in thirty hours.

Dr. Montgomery,¹ of Philadelphia, did tracheotomy because he was unable to reach the tube with the retractor. He thought that the tube, which, he states, was of small size for the child, had been forced below the vocal cords; it, however, had been coughed up and swallowed, being passed per rectum two days later. This child recovered. Dr. J. Eichberg, of Cincinnati, reports² two cases where he had to tracheotomize the child in order to recover the tube:

Case 1, aged seven. After the tube had been in the larynx for six days, he found that it had fallen "by its own weight" down so far as to require tracheotomy in order to remove it; the wound was made through the cricoid cartilage, and he tried to get primary union, but failed, but was obliged afterward to introduce a tracheal tube. Result, recovery.

Case 2, aged three. Five days after its introduction he sought to remove the tube, but failed, because the instrument, which was an old extractor, slipped, and, in his attempts at removal, he forced the tube into the trachea. By operating he recovered the tube, and the child made a good recovery. Here again he tried to get primary union, but failed, having to resort later to the use of the tracheal tube.

Dr. H. H. Mudel, of St. Louis, seems to have been very unfortunate in his experience of the use of intubation. He reports³ six cases, in three of which he was obliged to resort to tracheotomy. His notes are scanty, and are as follows:

Case 1, seven years of age. Came near suffocating from loose membrane. Tracheotomy. No result noted.

Case 2, four years of age. Had had intubation tube in for four days. Tracheotomy because there was an

¹ The Medical News, March 5, 1887, vol. 50, No. 10.

² Lancet-Clinic of Cincinnati, vol. 18, Nos. 4 and 11, pages 97 and 321.

³ Weekly Medical Review of St. Louis, vol. 15, No. 3, January 15, 1887.

excess of secretion, and child was unable to swallow. Result : three weeks have elapsed since the operation, and he thinks child will recover.

Case 3, three to four years of age. Tracheotomy because tube could not be retained. Result : recovery.

Dr. Dillon Brown, of New York, reports one case : Child between one and two years of age. Tube failed to give relief. Cause was supposed to be due to loose membrane. Tracheotomy tube was introduced, but this failed to relieve the child's symptoms, death occurring on the table. Autopsy revealed the probable cause of failure, as the membrane extended down to the third and fourth division of the bronchi.

Thus, of 9 reported cases of tracheotomy following intubation, there were 3 deaths, 5 recoveries, and in one the result was not noted ; so we have a very good showing, as to the results of this secondary operation. Further, we must not forget that the operation was performed in one-third of the cases after the tube had been worn from four days up, and consequently to them is due some credit for having tided the child over the most critical period of the disease.

That accidents will occur these cases prove, but accidents of just as serious a nature occur during the performance of tracheotomy ; in both, however, they are the exception and not the rule.

The above-described accidents suggest to my mind the following queries :

1. What causes will necessitate the performance of tracheotomy after intubation ?
2. Can we avoid any of these causes or accidents ?
3. Can we tell beforehand whether intubation is going to fail ?

The causes which have called for in the past and may in the future call for operative interference are as follows :

(a) An intolerance on the part of the larynx to retain the tube.

(b) Inability to administer a proper amount of nourishment to the child.

(c) A plugging up of the tube with false membrane and mucus, or a dislodgement of pieces of membrane during the process of introduction.

(d) A return of the dyspnœa with an absence of the tube from the trachea, as in Dr. Montgomery's case.

(e) A wedging of the tube in the larynx, so that it cannot be removed through the mouth.

(f) A forcing of the tube, during its introduction, through the floor of the ventricle in place of passing it into the larynx.

Fortunately we can do something to avert the most of these accidents. Spasm of the larynx, as indicated by a short spasmodic cough, along with a frequent ejection of the tube, can be relieved by cracked ice by the mouth and counter-irritation to the neck. In the way of medication, I have found that full doses of belladonna and nitre, with a small dose of chloral, afford speedy relief to laryngeal spasm.

Inability on the part of the child to swallow will, I trust, soon be overcome by some modification of the present tube. As it is now, we can make use of rectal alimentation and skin inunctions, and when necessary we can feed through a rubber catheter.

When we are certain that the tube has been swallowed, tracheotomy could be postponed if we had another tube of the right size at hand. Wedging of the tube into the larynx, or passing it forcibly through the neighboring tissues will only occur where great violence is used by the operator and can be easily averted.

The only truly serious accident which has thus far been met with in the history of intubation is a dislodgement of pieces of membrane during introduction. In any individual case we cannot say whether such an accident will occur, yet it is gratifying to know that it does not happen as often as one would naturally suppose. When one is unfortunate enough to have such a case,

after the withdrawal of the tube, the child may relieve itself by coughing, or we may aid it by producing emesis, or by extracting the membrane with a pair of long tracheal forceps, as done once by Waxham, of Chicago, or as a *dernier ressort* we must perform tracheotomy.

In avoiding this accident strict attention to the details of the position of the child and of the management of the introducing instrument, along with great care and gentleness on the part of the operator, will be of some assistance.

Let us hope that the future will reveal to some one of us an improvement whereby this unfavorable accident may be overcome.

Finally, can we tell beforehand whether intubation is going to fail?

I think not, and since it has been clearly shown that intubation is able to accomplish the same result as tracheotomy, in the light of my own experience, and of the expressed opinions of many others, I am inclined to resort to tracheotomy only after I have proved that intubation has failed.

STATISTICAL RECORDS OF INTUBATION, WITH REPORT OF EIGHT HUNDRED AND SIX CASES.

By DILLON BROWN, M.D.,

NEW YORK.

Number.	Date.	Operator.	Sex.	Age.	Duration before intubation of		Urine.	Cause of death.	Complications.	Result.
					Laryngeal symptoms.	Pharyngeal diphtheria.				
1	Dec., 1885	Joseph O'Dwyer.	F.	3 yrs. 3 mos.	2 days.	1 day.	Not exam.	Extension to bronchi.	.....	Died 2 days after intubation.
2	"	"	F.	14 months.	.....	Several days	"	Exhaustion.	.....	Died 6 hours after intubation.
3	"	"	M.	18 months.	1 day.	4 days.	"	Extension to bronchi.	.....	Died 7 hours after intubation.
4	"	"	F.	3 yrs. 4 mos.	5 days.	4 days.	Albumen.	Extension to bronchi.	.....	Died 2 days 10 hours after intubation.
5	Feb., 1886	"	M.	2 yrs. 3 mos.	3 days.	None.	"	Nephritis.	.....	Died 8 days 3 hours after intubation.
6	Mar., 1886	"	M.	5 years.	3 days.	3 days.	"	Uræmic convulsions.	.....	Died 1 day 9 hours after intubation.
7	April, 1886	"	M.	3 yrs. 1 mo.	2 days.	7 days.	"	Suppression of urine.	.....	Died 4 days 1½ hour after intubation.
8	"	"	M.	2 yrs. 5 mos.	1 day.	Several days	Not exam.	Exhaustion.	.....	Died 36 hours after intubation.
9	May, 1886	"	F.	3 yrs. 9 mos.	1½ day.	None.	Albumen.	Sepsis.	.....	Died 6 hours after intubation.
10	"	"	F.	3 yrs. 2 mos.	1½ day.	Next day.	Not exam.	Pneumonia.	.....	Died 5 days 8½ hours after intubation.
11	"	"	F.	6 years.	2 days.	Several days	No albumen.	Exhaustion.	Followed scarlet fever.	Died 5 days after intubation.
12	"	"	F.	7 years.	3 days.	Not noted.	Not exam.	Pneumonia.	Pneumonia when intubed.	Died 18 hours after intubation.
13	"	"	M.	3 yrs. 3 mos.	4 days.	1 week.	"	.....	.....	Recovered. Tube worn 4 days.
14	"	"	F.	18 months.	2 days.	Several days	"	Extension to bronchi.	.....	Died 2 days after intubation.
15	June, 1886	"	F.	3 yrs. 6 mos.	2 days.	"	"	Convulsions.	.....	Died 1 day 8 hours after intubation.
16	"	"	M.	2 yrs. 6 mos.	1 day.	Few hours.	"	Extension to bronchi.	.....	Died 2 days 6½ hours after intubation.
17	"	"	F.	2 yrs. 6 mos.	1 day.	2 days.	"	Sepsis; convulsions.	.....	Died 1 day 8 hours after intubation.
18	July, 1886	"	M.	4 yrs. 2 mos.	1 day.	3 days.	Albumen.	.....	.....	Recovered. Tube worn 4 days 18½ hours.
19	"	"	M.	23 months.	1 day.	1 day.	"	Extension to bronchi.	.....	Died 3 days 7 hours after intubation.
20	"	"	M.	5 yrs. 6 mos.	2 days.	Next day.	"	Exhaustion.	.....	Died 2 days 10½ hours after intubation.
21	"	"	F.	4 yrs. 4 mos.	2 days.	Several days	"	.....	.....	Recovered. Wore tube 5 days 6 hours.
22	"	"	M.	7 years.	7 days.	4 days.	Not exam.	.....	.....	Recovered. Wore tube 3 days.
23	"	"	F.	4 yrs. 6 mos.	2 days.	Several days	Albumen.	Uræmia.	.....	Died 1 day 22½ hours after intubation.
24	"	"	F.	3 yrs. 1 mo.	2 days.	4 days.	"	Extension and pneumonia.	.....	Died 7 days after intubation.
25	Aug., 1886	"	M.	4 yrs. 8 mos.	2 days.	2 days.	Not exam.	Extension to bronchi.	.....	Died 2 days after intubation.
26	Sept., 1886	"	F.	2 years.	26 hours.	Several days	"	Extension to bronchi.	.....	Died 13 hours after intubation.
27	"	"	M.	5 yrs. 10 mos.	1 day.	2 days.	"	Exhaustion.	.....	Died 1 day 14½ hours after intubation.
28	"	"	F.	4 yrs. 4 mos.	3 days.	5 days.	"	.....	.....	Recovered. Wore tube 4 days 8 hours.
29	Oct., 1886	"	F.	3 years.	2 days.	None.	Albumen	Extension to bronchi.	.....	Died 2 days 9½ hours after intubation.
30	"	"	F.	6 yrs. 7 mos.	2 days.	"	"	Pneumonia 25 hours after removal of tube.	Bronchitis.	Died 3 days 20 hours after intubation.
31	Nov., 1886	"	F.	3 yrs. 2 mos.	2 days.	Several days	"	Nephritis; œdema of lungs.	.....	Died 4 days 22½ hours after intubation.
32	"	"	M.	2 yrs. 11 mos.	36 hours.	None.	None.	.....	.....	Recovered. Wore tube 5 days.
33	"	"	M.	5 yrs. 6 mos.	3 days.	4 days.	Not exam.	.....	.....	Recovered. Wore tube 68 hours.
34	"	"	F.	18 months.	12 hours.	2 days.	"	Extension to bronchi.	.....	Died 15 hours after intubation.
35	"	"	F.	4 years.	1 day.	1 day.	None.	.....	.....	Recovered. Wore tube 10 days 6 hours.
36	"	"	F.	6 yrs. 11 mos.	4 days.	7 days.	Albumen.	Sepsis.	.....	Died 1 day 4 hours after intubation.
37	"	"	F.	20 months.	4 days.	3 days.	Not exam.	.....	.....	Died 36 hours after intubation.
38	"	"	M.	2 yrs. 11 mos.	3 days.	5 days.	Albumen.	Extension to bronchi.	.....	Died 2½ days after intubation.
39	"	"	F.	15 months.	6 days.	9 days.	Not exam.	.....	Measles.	Recovered. Wore tube 9 days.
40	"	"	F.	20 months.	1 day.	3 days.	"	Extension to bronchi.	.....	Died 2 days after intubation.
41	Dec., 1886	"	M.	11 years.	2 days.	4 days.	Albumen.	œdema of lungs.	.....	Died 12 hours after intubation.
42	"	"	M.	5 years.	2 days.	None.	"	.....	.....	Recovered. Wore tube 6 days.
43	"	"	M.	2 yrs. 6 mos.	7 days.	"	.....	Broncho pneumonia.	.....	Died 2 days after intubation.
44	"	"	M.	2 years.	3 days.	6 days.	.....	Extension to bronchi.	.....	Died 1 day 20 hours after intubation.
45	"	"	M.	3 yrs. 5 mos.	1 day.	2 days.	None.	Extension to bronchi.	.....	Died 2 days 9 hours after intubation.
46	"	"	M.	3 yrs. 2 mos.	7 days.	7 days.	.....	.....	.....	Recovered. Wore tube 6 days 19 hours.
47	"	"	F.	10 months.	1 day.	2 days.	Not exam.	Extension to bronchi.	.....	Died 1 day 14 hours after intubation.
48	"	"	M.	6 yrs. 2 mos.	7 days.	3 days.	"	Extension to bronchi.	.....	Died 19½ hours after intubation.
49	"	"	M.	8 years.	36 hours.	5 days.	None.	.....	.....	Recovered. Wore tube 2 days 9 hours.
50	"	"	M.	4 years.	2 days.	4 days.	Albumen.	Extension to bronchi.	.....	Died 2 days 22 hours after intubation.
51	"	"	F.	9 years.	2 days.	10 days.	.....	.....	Measles.	Recovered. Wore tube 7 days 22½ hours.
52	Jan., 1887	"	M.	3 yrs. 3 mos.	1 day.	Present.	None.	Extension to bronchi.	.....	Died 3 days 21 hours after intubation.
53	"	"	F.	6 yrs. 5 mos.	36 hours.	"	Albumen.	Extension to bronchi.	.....	Died 5 days 2 hours after intubation.
54	"	"	M.	3 yrs. 5 mos.	1 day.	Next day.	.....	.....	Not seen after operation.	Died 4 days after intubation.
55	"	"	F.	3 yrs. 4 mos.	1 day.	Present.	Albumen.	Sepsis.	Sepsis.	Died 17 hours after intubation.
56	"	"	M.	4 yrs. 6 mos.	3 days.	"	"	Extension to bronchi.	.....	Died 8 days after intubation.
57	"	"	F.	2 yrs. 10 mos.	36 hours.	None.	.....	Extension to bronchi.	.....	Died 1 day 2 hours after intubation.
58	"	"	M.	3 yrs. 6 mos.	.....	.....	.....	Pneumonia.	Measles; pneumonia.	Died 62 hours after intubation.
59	Feb., 1887	"	M.	4 yrs. 6 mos.	36 hours.	None.	.....	Extension to bronchi.	.....	Died 16½ hours after intubation.
60	"	"	F.	2 yrs. 6 mos.	15 hours.	3 days.	Not exam.	Extension to bronchi.	.....	Died 1 day after intubation.
61	"	"	M.	2 yrs. 8 mos.	4 days.	5 days.	Albumen.	Extension to bronchi.	.....	Died 9 days after intubation.

Number.	Date.	Operator.	Sex.	Age.	Duration before intubation of		Urine.	Cause of death.	Complications.	Result.
					Laryngeal symptoms.	Pharyngeal diphtheria.				
62	Mar., 1887	Joseph O'Dwyer.	M.	3 yrs. 6 mos.	3 days.	6 days.	Albumen.	.....	.....	Recovered. Wore tube 26 hours.
63	"	"	F.	2 yrs. 6 mos.	1 day.	None.	Not exam.	Extension to bronchi.	.....	Died 1 day after intubation.
64	"	"	F.	5 years.	2 days.	"	Albumen.	.....	.....	Recovered. Wore tube 6 days.
65	"	"	....	18 months.	36 hours.	4 days.	Not exam.	.....	.....	Recovered. Wore tube 4 days 4 hours.
66	"	"	F.	4 months.	2 days.	7 days.	"	Broncho-pneumonia.	.....	Died 1 day 16 hours after intubation.
67	"	"	F.	8 yrs. 9 mos.	4 days.	7 days.	"	Exhaustion.	.....	Died 2 days after intubation.
68	"	"	M.	3 yrs. 7 mos.	14 days.	14 days.	None.	.....	.....	Recovered. Wore tube 3 days 21½ hours.
69	April, 1887	"	M.	23 months.	3 days.	1 day.	Not exam.	Extension to bronchi.	.....	Died 1 day after intubation.
70	"	"	M.	2 yrs. 2 mos.	3 days.	None.	"	Extension to bronchi.	.....	Died 2 days after intubation.
71	"	"	F.	19 months.	3 days.	"	"	Asthenia.	Bronchitis.	Died 2 days after intubation.
72	"	"	F.	4 years.	3 days.	10 days.	None.	Nephritis.	.....	Died 2 days 4 hours after intubation.
73	May, 1887	"	F.	4 yrs. 9 mos.	3 days.	3 days.	Albumen.	Sepsis; exhaustion.	.....	Died 7 days after intubation.
74	"	"	M.	5 yrs. 9 mos.	1 day.	21 days.	"	.....	Scarlet fever; suppurating cervical glands	Recovered. Wore tube 4 days 10 hours.
75	"	"	M.	7 yrs. 1 mo.	¾ day.	None.	None.	.....	.....	Recovered. Wore tube 1 day.
76	"	"	F.	3 yrs. 1 mo.	36 hours.	14 days.	Not exam.	Extension to bronchi.	.....	Died 2 days 5 hours after intubation.
77	"	"	F.	.....	1 day.	Present.	.....	Extension to bronchi.	Sepsis.	Died 2 days after intubation.
78	"	"	M.	4 yrs. 9 mos.	3 days.	4 days.	.....	.....	.....	Recovered. Wore tube 4 days.
79	July, 1885	Dillon Brown. ³⁰	M.	3 yrs. 3 mos.	2 days.	5 days.	Albumen.	.....	.....	Recovered. Wore tube 14 days.
80	Oct., 1885	"	M.	16 months.	1 day.	4 days.	"	Extension to bronchi.	.....	Died 1 day after intubation.
81	Nov., 1885	"	M.	1 yr. 11 mos.	1 day.	8 days.	"	Double broncho-pneumonia.	Rickets.	Died 6 days 16 hours after intubation.
82	"	"	F.	3 years.	6 hours.	.....	"	Double broncho-pneumonia.	.....	Died 2½ days after intubation.
83	"	"	M.	3 yrs. 4 mos.	Several days	4 weeks.	.....	Tuberculosis.	Tuberculosis.	Died 8 days after intubation.
84	Dec., 1885	"	F.	3 yrs. 4 mos.	1 day.	Present.	"	Extension to bronchi.	.....	Died 2½ days after intubation.
85	"	"	F.	3 yrs. 6 mos.	3 days.	2 days.	Albumen.	Extension to bronchi.	Pneumonia and pertussis.	Died 38 hours after intubation.
86	"	"	F.	3 yrs. 7 mos.	1 day.	3 days.	"	.....	.....	Recovered. Wore tube 3 days 15 hours.
87	"	"	F.	11 months.	¾ day.	1 day.	"	Swelling over the top of the tube.	.....	Died 14½ hours after intubation.
88	"	"	F.	3 yrs. 3 mos.	1 day.	None.	"	Extension to bronchi.	.....	Died 3 days after intubation.
89	Jan., 1886	"	F.	4 yrs. 8 mos.	2 days.	2 days.	"	.....	Pertussis.	Recovered. Wore tube 2½ days.
90	"	"	F.	1 year.	1 day.	None.	Not exam.	Extension to bronchi.	Varicella.	Died 18 hours after intubation.
91	"	"	F.	3 yrs. 9 mos.	1 day.	11 days.	.....	.....	Pertussis.	Recovery. Wore tube 39 hours.
92	"	"	F.	3 yrs. 5 mos.	1 day.	1 day.	None.	Extension to bronchi.	.....	Died 21½ hours after intubation.
93	"	"	F.	5 months.	2 days.	2 days.	.....	Extension to bronchi.	.....	Died 21½ hours after intubation.
94	"	"	F.	4 yrs. 6 mos.	¾ day.	None.	Not exam.	Exhaustion.	Syphilis; marasmus.	Died ¾ day after intubation.
95	"	"	F.	3 yrs. 4 mos.	1 day.	6 days.	"	Extension to bronchi.	Pertussis.	Died 2 days after intubation.
96	Feb., 1886	"	F.	2 yrs. 2 mos.	1 day.	1 day.	Albumen.	.....	.....	Recovered. Wore tube 12 days.
97	"	"	M.	5½ months.	1 day.	1 day.	"	Double broncho-pneumonia.	.....	Died 1 day after intubation.
98	Mar., 1886	"	F.	7 months.	6 hours.	.....	Not exam.	Extension to bronchi.	Varicella.	Died 2 days after intubation.
99	"	"	M.	3 yrs. 6 mos.	4 days.	5 days.	Albumen.	.....	.....	Recovered. Wore tube 4 days 2 hours.
100	"	"	M.	3 years.	2 days.	2 days.	"	Extension to bronchi.	.....	Died 2 days 14 hours after intubation.
101	April, 1886	"	F.	3 years.	1 day.	1 day.	Not exam.	Extension to bronchi.	Varicella.	Died 2 days after intubation.
102	"	"	M.	8 months.	1 day.	2 days.	"	Pneumonia.	.....	Died 9 hours after intubation.
103	May, 1886	"	M.	2 years.	1 day.	1 day.	"	Extension to bronchi.	.....	Died 24 hours after intubation.
104	Mar., 1886	"	F.	18 months.	10 hours.	None.	"	Extension to bronchi.	.....	Died 7 hours after intubation.
105	"	"	F.	8 years.	18 hours.	4 days.	Albumen.	Exhaustion.	.....	Died 4 days after intubation.
106	May, 1886	"	M.	13 months.	4 days.	Several days.	"	Nephritis.	.....	Died 16 days after intubation.
107	June, 1886	"	F.	2 yrs. 8 mos.	2 days.	9 days.	"	Extension to bronchi.	.....	Died 2 days after intubation.
108	"	"	M.	2 yrs. 4 mos.	1 day.	None.	"	Broncho-pneumonia.	.....	Died 2 days 21 hours after intubation.
109	"	"	M.	6 years.	3 days.	4 days.	"	Suppression of urine.	.....	Died 5 days after intubation.
110	"	"	F.	2 yrs. 6 mos.	1 day.	Several days.	Not exam.	Extension to bronchi.	.....	Died 1½ day after intubation.
111	July, 1886	"	M.	4 years.	36 hours.	None.	Albumen.	Extension to bronchi.	.....	Died 1 day 13½ hours after intubation.
112	"	"	M.	4 years.	2 days.	Several days.	"	.....	.....	Recovered. Wore tube 5½ days.
113	"	"	M.	3 years.	1 day.	None.	Not exam.	Exhaustion.	.....	Died 1 day 6½ hours after intubation.
114	Aug., 1886	"	F.	2 yrs. 9 mos.	1 day.	7 days.	Albumen.	Extension to bronchi.	.....	Died 3 days after intubation.
115	"	"	F.	4 yrs. 6 mos.	32 hours.	4 days.	"	Extension to bronchi.	.....	Died 4 days after intubation.
116	Sept., 1886	"	M.	21 months.	2 days.	4 days.	"	Extension to bronchi.	.....	Died 1 day 4½ hours after intubation.
117	"	"	M.	4 yrs. 6 mos.	9 days.	6 days.	"	.....	.....	Recovered. Wore tube 4 days.
118	"	"	M.	8 yrs. 1 mo.	3 days.	2 days.	"	Extension to bronchi.	.....	Died 7 days after intubation.
119	Oct., 1886	"	F.	7 years.	.....	Present.	.....	Extension to bronchi.	.....	Died 6 days after intubation.
120	"	"	F.	2 yrs. 6 mos.	5 days.	7 days.	Albumen.	Uræmic convulsions.	.....	Died 1 day 9 hours after intubation.
121	"	"	F.	6 years.	4 days.	6 days.	"	Suppression of urine.	.....	Died 2 days 1 hour after intubation.
122	"	"	M.	2 yrs. 2 mos.	1 day.	10 days.	None.	Extension to bronchi.	.....	Died 7 days after intubation.
123	"	"	F.	4 yrs. 2 mos.	1 day.	3 days.	Albumen.	Extension to bronchi.	.....	Died 2 days 10 hours after intubation.
124	Nov., 1886	"	F.	3 years.	4 days.	7 days.	"	Extension to bronchi.	.....	Died 4 days after intubation.
125	"	"	M.	1 year.	5 days.	7 days.	Not exam.	Extension to bronchi.	.....	Died 5 days after intubation.

Number.	Date.	Operator.	Sex.	Age.	Duration before intubation of		Urine.	Cause of death.	Complications.	Result.
					Laryngeal symptoms.	Pharyngeal diphtheria.				
126	Nov., 1886	Dillon Brown.	M.	2 yrs. 7 mos.	7 days.	1 day.	Albumen.	Convulsions.	.....	Died 1 day 17 hours after intubation.
127	Dec., 1886	"	M.	5 years.	1/2 day.	14 days.	None.	Exhaustion.	.....	Died 26 hours after intubation.
128	"	"	M.	3 yrs. 2 mos.	5 days.	7 days.	Albumen.	.....	.....	Recovered. Wore tube 4 days 5 hours.
129	"	"	F.	2 yrs. 1 mo.	27 hours.	4 days.	"	Convulsions.	.....	Died 19 hours after intubation.
130	"	"	M.	13 months.	4 days.	None.	"	"	Measles.	Died 2 days 2 1/2 hours after intubation.
131	"	"	F.	2 years.	3 days.	Several days	"	Pushing down membrane.	.....	Died 18 days after intubation.
132	"	"	F.	3 yrs. 6 mos.	18 hours.	4 days.	"	Sepsis.	Sepsis.	Died 12 hours after intubation.
133	"	"	F.	5 years.	3 days.	None.	"	Exhaustion.	.....	Died 3 days after intubation.
134	Jan., 1887	"	F.	2 years.	2 days.	1 day.	None.	.....	.....	Recovered. Wore tube 3 days.
135	"	"	F.	4 years.	3 days.	7 days.	"	Extension to bronchi.	Measles.	Died 5 days 17 hours after intubation.
136	"	"	M.	2 years.	1/2 day.	.....	"	Extension to bronchi.	to	Died 2 days after intubation.
137	"	"	F.	17 months.	1 day.	Several days	Albumen.	Convulsions.	to	Died 1 day 6 hours after intubation.
138	"	"	F.	5 years.	1 day.	None.	Not exam.	Extension to bronchi.	to	Died 19 hours after intubation.
139	"	"	M.	5 yrs. 4 mos.	8 days.	2 days.	Albumen.	Pneumonia.	"	Died 1 day 19 hours after intubation.
140	"	"	M.	13 months.	2 days.	Several days	Not exam.	Extension to bronchi.	to	Died 1 day 1 hour after intubation.
141	"	"	M.	19 months.	8 days.	.....	Albumen.	.....	"	Recovered. Wore tube 4 days.
142	"	"	F.	20 months.	1 day.	1 day.	Not exam.	Extension to bronchi.	to	Died 2 days 1 hour after intubation.
143	"	"	M.	19 months.	1 day.	7 days.	"	Extension to bronchi.	to	Died 8 hours after intubation.
144	Feb., 1887	"	M.	3 yrs. 2 mos.	16 hours.	Convalescent	Albumen.	.....	.....	Recovered. Wore tube 6 1/2 days.
145	"	"	F.	23 months.	1 day.	4 days.	"	Sepsis.	Sepsis.	Died 1 day after intubation.
146	"	"	F.	22 months.	2 days.	Several days	"	Extension to bronchi.	to	Died 1 day 4 hours after intubation.
147	"	"	M.	14 months.	36 hours.	"	"	After coughing out the tube.	.....	Died 28 days after intubation.
148	"	"	M.	2 yrs. 9 mos.	1 1/2 day.	10 days.	Not exam.	Extension to bronchi.	to	Died 1 day 6 hours after intubation.
149	"	"	M.	4 years.	2 days.	6 days.	"	Extension to bronchi.	to	Died 1 1/2 day after intubation.
150	Mar., 1887	"	M.	2 yrs. 9 mos.	2 days.	Several days	Albumen.	.....	.....	Recovered. Wore tube 6 days.
151	"	"	M.	5 years.	36 hours.	4 days.	Not exam.	Extension to bronchi.	to	Died 1 day after intubation.
152	"	"	M.	5 years.	3 days.	Several days	None.	.....	.....	Recovered. Wore tube 4 days.
153	"	"	M.	2 yrs. 5 mos.	4 days.	None.	Not exam.	Extension to bronchi.	to	Died 1 day after intubation.
154	"	"	M.	3 years.	4 days.	7 days.	Albumen.	.....	.....	Recovered. Wore tube 2 days.
155	"	"	M.	4 years.	2 1/2 days.	8 days.	"	Pneumonia.	.....	Died 10 days after intubation.
156	"	"	F.	3 yrs. 9 mos.	2 days.	7 days.	"	Sepsis.	.....	Died 2 days after intubation.
157	April, 1887	"	F.	20 months.	2 days.	2 days.	Not exam.	Pneumonia.	.....	Died 2 days 6 hours after intubation.
158	"	"	M.	5 years.	2 days.	4 days.	Albumen.	Sepsis.	.....	Died 7 days 18 hours after intubation.
159	"	"	M.	6 years.	4 days.	7 days.	"	.....	.....	Recovered. Wore tube 5 days.
160	"	"	F.	16 months.	1 day.	3 1/2 days.	Not exam.	Sepsis.	.....	Died 19 hours after intubation.
161	"	"	F.	4 yrs. 6 mos.	2 days.	.....	"	Extension to bronchi.	to Sepsis.	Died 1 day after intubation.
162	May, 1887	"	F.	3 yrs. 6 mos.	2 days.	7 days.	Albumen.	.....	.....	Recovered. Wore tube 6 days.
163	"	Francis Huber.	"	1 year.	.....	Present.	"	Heart failure.	.....	Died 18 hours after intubation.
164	"	"	"	2 years.	.....	"	"	Sepsis.	.....	Died 6 hours after intubation.
165	"	"	"	2 yrs. 8 mos.	.....	"	"	.....	.....	Recovered. Wore tube 6 days.
166	"	"	"	6 years.	.....	"	"	.....	Measles.	Recovered. Wore tube 5 days.
167	"	"	"	3 yrs. 8 mos.	.....	"	"	Nephritis; pneumonia.	.....	Died 3 1/2 days after intubation.
168	"	"	"	3 years.	.....	"	"	Uramic convulsions.	Measles.	Died 6 hours after intubation.
169	"	"	"	2 yrs. 2 mos.	.....	"	"	.....	.....	Recovered. Wore tube 5 days.
170	"	"	"	3 years.	.....	"	"	.....	Old mitral endocarditis.	Recovered. Wore tube 5 days.
171	"	"	"	2 yrs. 6 mos.	.....	"	"	Pulmonary edema of Bright's disease.	Measles.	Died 5 days after intubation.
172	"	"	"	1 year.	.....	"	"	.....	.....	Recovered. Wore tube 3 days.
173	"	"	"	2 yrs. 6 mos.	.....	"	"	Sepsis.	Sepsis.	Died 4 hours after intubation.
174	"	"	"	11 months.	.....	"	"	.....	Measles.	Recovered. Wore tube ———
175	"	"	"	15 months.	.....	"	"	Exhaustion.	Measles and gastro-enteritis.	Died 12 hours after intubation.
176	"	"	"	18 months.	.....	"	"	Pneumonia.	.....	Died 2 1/2 days after intubation.
177	"	"	"	3 years.	.....	None.	"	.....	Measles.	Recovered. Wore tube 4 days.
178	"	"	"	4 years.	.....	Present.	"	.....	.....	Recovered. Wore tube 4 days.
179	"	"	"	2 years.	.....	"	"	Pneumonia.	.....	Died 2 1/2 days after intubation.
180	"	"	"	3 years.	.....	"	"	Sepsis.	Hemiplegia.	Died 3 days after intubation.
181	"	"	"	18 months.	.....	"	"	Pneumonia.	.....	Died 2 days after intubation.
182	"	"	"	11 months.	.....	"	"	Sepsis.	.....	Died 2 days after intubation.
183	"	"	"	2 yrs. 8 mos.	.....	None.	"	Heart failure.	Measles.	Recovered. Wore tube 10 days.
184	"	"	"	8 months.	.....	Present.	"	.....	Pneumonia.	Died 18 hours after intubation.
185	"	"	"	4 yrs. 6 mos.	.....	None.	"	.....	Measles.	Recovered. Wore tube 6 days.
186	"	"	"	2 yrs. 8 mos.	.....	.....	"	Pneumonia.	"	Died 3 1/2 days after intubation.
187	"	"	"	3 yrs. 6 mos.	.....	Present.	"	.....	.....	Recovered. Wore tube 5 days.
188	"	"	"	10 1/2 months.	.....	"	"	.....	Pneumonia on second day.	Recovered. Wore tube 3 1/2 days.
189	"	"	"	2 yrs. 10 mos.	.....	"	"	Extension to bronchi.	to	Died 2 days after intubation.
190	"	"	"	3 years.	.....	"	"	Sepsis.	.....	Died 2 days after intubation.
191	"	"	"	4 yrs. 6 mos.	.....	"	"	.....	Pneumonia.	Recovered. Wore tube 5 days.
192	"	"	"	2 years.	.....	None.	"	.....	.....	Died.
193	"	"	"	11 months.	.....	Present.	"	Exhaustion.	Pneumonia.	Recovered. Wore tube 7 days.
194	"	"	"	13 months.	.....	"	"	.....	.....	Died 2 1/2 days after intubation.
195	"	"	"	9 months.	.....	Present.	"	.....	Measles.	Died 6 hours after intubation.
196	"	"	"	2 yrs. 6 mos.	.....	"	"	.....	"	Recovered. Wore tube 5 1/2 days.
197	"	"	"	7 years.	.....	"	"	.....	.....	Recovered. Wore tube 64 hours.
198	"	"	"	3 yrs. 6 mos.	.....	"	"	Extension to bronchi.	to	Died 2 days after intubation.
199	"	"	"	18 months.	.....	None.	"	Heart failure.	.....	Died 18 hours after intubation.
200	"	"	"	18 months.	.....	Present.	"	Convulsions.	.....	Died 10 hours after intubation.
201	"	"	"	9 1/2 months.	.....	None.	"	.....	.....	Recovered. Wore tube 5 days.
202	"	"	"	2 yrs. 6 mos.	.....	Present.	"	.....	.....	Recovered. Wore tube 6 days.
203	"	"	"	5 yrs. 6 mos.	.....	"	"	.....	.....	Died 6 days after intubation.
204	"	"	"	2 yrs. 9 mos.	.....	"	"	Extension to bronchi.	to	Died 2 days after intubation.
205	"	"	"	22 months.	.....	"	"	.....	.....	Recovered. Wore tube 6 days.
206	"	"	"	4 years.	.....	"	"	.....	.....	Recovered. Wore tube 5 days.
207	"	"	"	3 years.	.....	"	"	Extension and pneumonia.	Pneumonia.	Died 2 days after intubation.
208	"	"	"	11 months.	.....	None.	"	Extension and pneumonia.	.....	Died 2 1/2 days after intubation.
209	"	"	"	5 years.	.....	Present.	"	Extension to bronchi.	to	Died 3 days after intubation.

Number.	Date.	Operator.	Sex.	Age.	Duration before intubation of		Urine.	Cause of death.	Complications.	Result.
					Laryngeal symptoms.	Pharyngeal diphtheria.				
210	July, 1885	F. E. Waxham (reported by M. P. Hatfield. ^{10, 28}	M.	16 months.	3 days.	9 days.	.....	Edema of the lungs.	.....	Died 27 hours after intubation.
211	April, 1885	F. E. Waxham. ¹⁵	...	2 yrs. 1 mo.	1 day.	3 days.	.....	Extension to bronchi.	.....	Died 30 hours after intubation.
212	"	" " 28	F.	3 years.	.....	.....	.....	Two hours after removal of tube from stenosis.	.....	Died 36 hours after intubation.
213	Sept., 1885	" "	F.	5 years.	2 days.	7 days.	.....	.....	.....	Recovered. Wore tube 1 week.
214	"	" "	F.	2 yrs. 7 mos.	1 day.	3 days.	.....	Pneumonia.	.....	Died 6 days after intubation.
215	Nov., 1885	" " 17, 20	M.	20 months.	3 days.	5 days.	.....	.....	.....	Recovered. Wore tube 9 days.
216	"	" "	F.	4 years.	2 days.	6 days.	.....	Sepsis.	.....	Died 2 days after intubation.
217	"	" "	...	2 yrs. 2 mos.	.....	.....	.....	.....	.....	Recovered. Wore tube 13 days.
218	"	" "	...	3 years.	.....	.....	.....	Extension to bronchi.	.....	Died 2 days after intubation.
219	"	" "	M.	5 years.	8 days.	8 days.	.....	Extension to bronchi.	.....	Died 50 hours after intubation.
220	"	" "	M.	5 years.	2 days.	14 days.	.....	.....	.....	Recovered. Wore tube 4 days.
221	May, 1886	" " 19	...	14 months.	.....	Present.	.....	.....	Measles.	Recovered. Wore tube 3½ days.
222	"	" "	...	3 years.	.....	"	.....	Extension to bronchi.	.....	Died 4 days after intubation.
223	Oct., 1886	" " 21	F.	8 years.	6 days.	.....	.....	Pneumonia.	Electrolysis.	Died 1 day 9 hours after intubation.
224	Aug., 1886	" " 26	M.	9 months.	1 day.	1 day.	.....	.....	.....	Recovered. Wore tube 3 days.
225	Nov., 1885	" " 29	F.	7 years.	Several days	Several days	.....	Congestion of lungs.	.....	Died 1 day after intubation.
226	Dec., 1885	" "	M.	5 years.	.....	"	.....	.....	Measles.	Recovered. Wore tube 3 days.
227	"	" "	...	4 years.	3 days.	Present.	.....	.....	.....	Recovered. Wore tube 4 days.
228	"	" "	M.	4 years.	2 days.	7 days.	.....	.....	.....	Recovered. Wore tube 3 days.
229	Jan., 1886	" "	F.	5 years.	.....	.....	.....	.....	.....	Recovered. Wore tube 3 days.
230	Dec., 1885	" "	...	3 years.	.....	Several days	.....	Sepsis; pneumonia.	.....	Died 2 days after intubation.
231	Mar., 1886	W. P. Northrup. ²⁶	F.	2 yrs. 9 mos.	1 day.	6 days.	Albumen.	.....	.....	Recovered. Wore tube 6½ days.
232	April, 1886	" " 29	F.	5 yrs. 3 mos.	1½ day.	1½ day.	"	Extension to bronchi.	.....	Died 1 day 13 hours after intubation.
233	May, 1886	" "	F.	5 years.	3 days.	1 day.	"	.....	.....	Recovered. Wore tube 5 days.
234	"	" "	M.	3 yrs. 9 mos.	5 days.	5 days.	"	Extension to bronchi.	.....	Died 3½ days after intubation.
235	"	" "	M.	3 yrs. 9 mos.	3 days.	7 days.	"	.....	.....	Recovered. Wore tube 40 hours.
236	June, 1886	" "	M.	5 yrs. 10 mos.	1 day.	4 days.	"	Pneumonia.	.....	Died 4 days after intubation.
237	"	" "	F.	7 years.	1 day.	2 days.	"	Sudden heart failure.	.....	Died ½ day after intubation.
238	"	" "	M.	5 years.	2 days.	1 day.	None.	Sepsis.	.....	Died 1 day after intubation.
239	"	" "	M.	1 yr. 11 mos.	11 days.	Present.	Albumen.	.....	.....	Recovered. Wore tube 6 days.
240	Sept., 1886	" " 24	F.	5 yrs. 2 mos.	1 day.	1 day.	Not noted.	Extension to bronchi.	.....	Died 1 day after intubation.
241	"	" "	M.	7 years.	5 days.	5 days.	Albumen.	.....	.....	Recovered. Wore tube 5 days.
242	Oct., 1886	" "	F.	25 months.	2 days.	Present.	Not exam.	Extension to bronchi (?).	.....	Died 1 day after intubation.
243	Nov., 1886	" "	F.	4 yrs. 4 mos.	2 days.	2 days.	.....	Extension to bronchi (?).	.....	Died 31 hours after intubation.
244	"	" "	F.	4 yrs. 6 mos.	2 days.	2 days.	Albumen.	Extension to bronchi (?).	.....	Died 59 hours after intubation.
245	"	" "	M.	2 yrs. 6 mos.	.....	.....	Not exam.	Extension to bronchi (?).	.....	Died 2 hours after intubation.
246	"	" "	M.	14 months.	8 hours.	2 days.	"	Double pneumonia.	.....	Died 45 hours after intubation.
247	Dec., 1886	" "	M.	23 months.	1 day.	2 days.	"	Extension to bronchi.	.....	Died 51 hours after intubation.
248	"	" "	F.	22 months.	½ day.	1 day.	.....	Heart failure.	.....	Died 20 hours after intubation.
249	"	" "	F.	10 months.	½ day.	4 days.	.....	Extension to bronchi.	.....	Died 62 hours after intubation.
250	Jan., 1887	" "	F.	4 yrs. 8 mos.	2 days.	2 days.	.....	Extension to bronchi.	.....	Died 18 hours after intubation.
251	"	" "	M.	4 yrs. 8 mos.	.....	4 days.	.....	Extension to bronchi.	.....	Died 38 hours after intubation.
252	"	" "	F.	4 years.	3 days.	2 days.	Not exam.	Extension to bronchi.	.....	Died 32 hours after intubation.
253	"	" "	F.	4 years.	½ day.	1 day.	"	Pneumonia.	.....	Died 65 hours after intubation.
254	"	" "	M.	2 years.	4 hours.	3 days.	.....	Extension to bronchi.	.....	Died 12 hours after intubation.
255	"	" "	M.	20 months.	1 day.	2 days.	.....	Extension to bronchi.	.....	Died 48 hours after intubation.
256	"	" "	M.	3 years.	1 day.	3 days.	.....	Extension to bronchi.	Measles.	Died 48 hours after intubation.
257	Feb., 1887	" "	F.	4 yrs. 6 mos.	½ day.	None.	Albumen.	.....	.....	Recovered. Wore tube 7 days.
258	April, 1887	" "	M.	6 years.	2 days.	9 days.	.....	Extension to bronchi.	.....	Died 15 hours after intubation.
259	"	" "	F.	3 years.	5 hours.	.....	Albumen.	Exhaustion.	.....	Died 5½ days after intubation.
260	"	" "	F.	16 months.	½ day.	17 days.	"	Extension to bronchi.	Scarlatina.	Died 8 hours after intubation.
261	May, 1887	" "	M.	4 yrs. 3 mos.	5 days.	5 days.	.....	Extension to bronchi.	Rickets.	Died 36 hours after intubation.
262	Sept., 1886	James McManus.	M.	2 years.	1 day.	4 days.	None.	Asthenia.	.....	Died 2 hours after intubation.
263	Nov., 1886	" "	F.	11 months.	20 hours.	3 days.	Not exam.	"	Measles.	Died 11 hours after intubation.
264	Dec., 1886	" "	F.	2 yrs. 6 mos.	14 hours.	7 days.	"	"	.....	Recovered. Wore tube 3 days.
265	Mar., 1887	" "	M.	9 yrs. 2 mos.	12 hours.	5 days.	None.	Asthenia.	.....	Died 8 hours after intubation.
266	April, 1887	" "	M.	7 years.	2 hours.	½ day.	"	"	.....	Recovered. Wore tube 4 days.
267	July, 1886	E. L. Cocks.	M.	6 years.	16 hours.	5 days.	.....	Laryngeal obstruction.	.....	Died. Coughed out tube.
268	"	" "	M.	7 years.	10 hours.	5 days.	.....	Cardiac failure.	.....	Died 5 days after intubation.
269	Aug., 1886	" "	M.	9 years.	7 hours.	7 days.	.....	Extension to bronchi.	After tracheotomy.	Died.
270	Sept., 1886	" "	F.	5 years.	12 hours.	4 days.	.....	.....	.....	Recovered. Wore tube 3 days.
271	Nov., 1886	" "	F.	2 years.	10 hours.	4 days.	.....	.....	Tracheotomy refused.	Died.
272	Dec., 1886	" "	F.	3 years.	6 hours.	5 days.	.....	.....	Tube obstructed.	Died 4 days after intubation.
273	"	" "	F.	7 years.	12 hours.	5 days.	.....	.....	.....	Recovered. Wore tube 3 days.
274	Jan., 1887	" "	F.	2 years.	10 hours.	3 days.	.....	.....	.....	Recovered. Wore tube 2 days.
275	Mar., 1887	" "	M.	9 years.	11 hours.	7 days.	.....	Pneumonia, 7 days after removal of tube.	.....	Died 11 days after intubation.
276	May, 1887	" "	F.	2 years.	7 hours.	4 days.	.....	Exhaustion 3 days after removal of tube.	.....	Died 5 days after intubation.
277	May, 1886	F. Van Fleet.	F.	2 yrs. 6 mos.	1 day.	3 days.	.....	Extension to bronchi.	.....	Died 2 days after intubation.
278	Oct., 1886	" "	M.	3 years.	½ day.	1 day.	Albumen.	.....	.....	Recovered. Wore tube 7 days.
279	"	" "	M.	6 years.	2 days.	14 days.	.....	.....	.....	Recovered. Wore tube 3 days.
280	Nov., 1886	" "	F.	2 years.	1 day.	Present.	.....	Pneumonia.	.....	Died 2 days after intubation.
281	"	" "	M.	10 years.	1 day.	.....	.....	Sepsis.	.....	Died 4 days after intubation.

Number.	Date.	Operator.	Sex.	Age.	Duration before intubation of		Urine.	Cause of death.	Complications.	Result.
					Laryngeal symptoms.	Pharyngeal diphtheria.				
282	Dec., 1886	F. Van Fleet.	F.	4 years.	4 days.	8 days.	.....	Pneumonia exhaustion.	Pneumonia.	Died 12 hours after intubation.
283	"	"	M.	5 years.	10 hours.	2 days.	.....	Exhaustion.	Broncho-pneumonia.	Died 55 hours after intubation.
284	"	"	M.	9 years.	2 days.	None.	.....	.....	.....	Recovered. Wore tube 10 days.
285	"	"	M.	11 years.	6 hours.	3 days.	.....	.....	.....	Recovered. Wore tube 4 days.
286	"	"	M.	5 years.	2 days.	4 days.	.....	.....	.....	Recovered. Wore tube 5 days.
287	Jan., 1887	"	M.	4 years.	36 hours.	2 days.	.....	Broncho-pneumonia.	.....	Died 4 days after intubation.
288	"	"	F.	3 years.	$\frac{1}{2}$ day.	6 days.	.....	Extension to bronchi.	.....	Died 3 days after intubation.
289	"	"	M.	2 years.	6 hours.	1 day.	.....	Heart failure.	Broncho-pneumonia.	Died 4 days after intubation.
290	"	"	M.	1 yr. 10 mos.	2 days.	None.	.....	Pneumonia.	.....	Died 5 days after intubation.
291	"	"	M.	2 yrs. 3 mos.	8 hours.	3 days.	.....	Asthenia.	Pneumonia.	Died 2 days after intubation.
292	"	"	M.	1 yr. 6 mos.	2 days.	4 days.	.....	Convulsions.	.....	Died 3 days after intubation.
293	"	"	M.	7 years.	8 days.	10 days.	.....	Exhaustion.	.....	Died 2 days after intubation.
294	Mar., 1887	"	M.	3 years.	2 days.	3 days.	Albumen.	Convulsions.	.....	Died 18 hours after intubation.
295	"	"	M.	4 years.	1 day.	3 days.	.....	Asthenia.	.....	Died 7 days after intubation.
296	April, 1887	"	F.	3 years.	2 days.	5 days.	.....	Extension to bronchi.	.....	Died 4 days after intubation.
297	"	"	F.	3 years.	36 hours.	None.	.....	.....	.....	Recovered. Wore tube 18 days.
298	May, 1887	"	F.	9 years.	1 day.	5 days.	.....	.....	.....	Recovered. Wore tube 15 days.
299	Mar., 1887	Frank Tipton. ⁴¹	M.	4 years.	1 day.	None.	.....	.....	.....	Recovered.
300	Nov., 1886	J. M. Bleyer.	M.	2 yrs. 10 mos.	12 hours.	2½ days.	.....	Sepsis.	.....	Died 1 day after intubation.
301	"	"	M.	6 years.	10 hours.	7 days.	.....	Broncho-pneumonia.	.....	Died 2 days 3 hours after intubation.
302	"	"	M.	2 years.	6 hours.	6 days.	Albumen.	.....	.....	Recovered. Wore tube 4 days.
303	Dec., 1886	"	M.	18 months.	12 hours.	5 days.	.....	Heart failure.	.....	Died 2 days 2 hours after intubation.
304	"	"	M.	7 years.	15 hours.	4½ days.	Albumen.	.....	Scarlet fever.	Recovered. Wore tube 4 days 18 hours.
305	Jan., 1887	"	M.	3 years.	7 hours.	7½ days.	.....	.....	.....	Recovered. Wore tube 3 days 20 hours.
306	"	"	F.	4 years.	17 hours.	3½ days.	.....	.....	.....	Recovered. Wore tube 4 days.
307	"	"	F.	2 yrs. 6 mos.	10 hours.	2 days.	.....	.....	.....	Recovered. Wore tube 3 days.
308	"	"	M.	2 years.	1 day.	8 days.	.....	Bronchitis.	.....	Died 7 hours after intubation.
309	"	"	M.	3 years.	7 hours.	3½ days.	.....	.....	.....	Died 15 hours after intubation.
310	"	"	M.	2 years.	5 hours.	3 days.	.....	Pneumonia.	.....	Died 2 days after intubation.
311	Feb., 1887	"	M.	3 yrs. 6 mos.	9 hours.	1½ day.	.....	.....	.....	Recovered. Wore tube 3½ days.
312	"	"	M.	3 years.	7 hours.	3 days.	.....	Extension to bronchi.	Rachitis.	Died 10 hours after intubation.
313	"	"	F.	13 months.	5 hours.	2 days.	.....	Extension to bronchi.	.....	Died 15 hours after intubation.
314	"	"	M.	10 months.	4 hours.	1 day.	.....	Bronchitis.	.....	Died 18 hours after intubation.
315	"	"	M.	7 years.	9 hours.	7½ days.	.....	.....	.....	Recovered. Wore tube 4 days.
316	Mar., 1887	"	F.	18 months.	7 hours.	2 days.	.....	Broncho-pneumonia.	.....	Died 1 day after intubation.
317	"	"	M.	2 yrs. 2 mos.	5 hours.	None.	.....	.....	.....	Recovered. Wore tube 3½ days.
318	"	"	M.	2 yrs. 4 mos.	4 hours.	4 days.	.....	Pneumonia.	.....	Died 2 days after intubation.
319	"	"	M.	13 months.	7 hours.	4½ days.	.....	Acute bronchitis.	.....	Died 1½ day after intubation.
320	"	"	M.	3 years.	12 hours.	5½ days.	.....	Double pneumonia.	.....	Died 1 day after intubation.
321	"	"	F.	2 years.	5 hours.	None.	.....	.....	.....	Recovered. Wore tube 2 days.
322	"	"	M.	2 yrs. 3 mos.	10 hours.	2 days.	.....	Heart failure.	Erysipelas of face.	Died 23 hours after intubation.
323	April, 1887	"	M.	2 years.	5 hours.	2½ days.	.....	"	.....	Died 1 day after intubation.
324	"	"	M.	4 years.	11 hours.	3 days.	.....	Diffuse bronchitis.	.....	Died 1½ day after intubation.
325	"	"	M.	4 yrs. 6 mos.	3 hours.	4 days.	.....	.....	.....	Recovered. Wore tube 3½ days.
326	"	"	F.	2 yrs. 3 mos.	7 hours.	2½ days.	.....	Asphyxia; tube expelled and not notified.	.....	Died 1½ day after intubation.
327	"	"	M.	1 yr. 6 mos.	15 hours.	3½ days.	.....	Double pneumonia.	.....	Died 1 day after intubation.
328	"	"	M.	22 months.	12 hours.	53 hours.	.....	Bronchitis.	.....	Died 1 day after intubation.
329	May, 1887	"	F.	3 yrs. 6 mos.	12 hours.	9 days.	.....	Exhaustion.	.....	Died 2 days after intubation.
330	"	"	M.	2 years.	.....	14 days.	.....	Pneumonia.	Rachitis.	Died 4 days after intubation.
331	"	"	F.	13 months.	5 hours.	4 days.	.....	Extension to bronchi.	.....	Died 15 days after intubation.
332	"	"	M.	1 yr. 6 mos.	7½ hours.	3½ days.	Albumen.	Extension to bronchi.	.....	Died 5 days after intubation.
333	"	"	M.	2 yrs. 6 mos.	15 hours.	7 days.	.....	.....	.....	Recovered. Wore tube 4 days.
334	"	"	M.	2 yrs. 3 mos.	4½ hours.	2½ days.	.....	Extension to bronchi.	.....	Died 2 days after intubation.
335	"	"	F.	3 yrs. 1 mo.	9 hours.	5 days.	.....	Pneumonia.	Swallowed tube.	Died 1½ day after intubation.
336	Jan., 1887	"	M.	6 years.	14 hours.	3 days.	.....	Scarlet fever.	Scarlet fever.	Died 22 hours after intubation.
337	April, 1887	"	M.	4 yrs. 6 mos.	7 hours.	8 days.	Albumen.	Extension to bronchi.	.....	Died 1½ day after intubation.
338	"	"	M.	1 yr. 6 mos.	4 hours.	4 days.	.....	Pneumonia.	.....	Died 27 hours after intubation.
339	May, 1887	"	M.	15 months.	4 hours.	5 days.	.....	Extension to bronchi.	.....	Died 12 hours after intubation.
340	Mar., 1887	"	M.	6 months.	8 hours.	3 days.	.....	Extension to bronchi.	.....	Died 1½ day after intubation.
341	May, 1887	"	M.	5 years.	9½ hours.	1 day.	.....	Extension to bronchi.	.....	Died 2 days 6 hours after intubation.
342	.....	J. J. Reid.	F.	7 yrs. 6 mos.	3 days.	.....	.....	.....	.....	Recovered. Wore tube 7 days.
343	.....	"	F.	11 months.	1 day.	.....	.....	Extension to bronchi.	.....	Died 4 days after intubation.
344	.....	"	M.	7 years.	3 days.	3 days.	.....	.....	.....	Recovered. Wore tube 18 hours.
345	.....	"	M.	2 yrs. 7 mos.	1 day.	2 days.	.....	Extension to bronchi.	.....	Died 16 hours after intubation.
346	.....	"	M.	2 yrs. 6 mos.	2 days.	.....	.....	Broncho-pneumonia.	Pneumonia.	Died 10 days after intubation.
347	.....	"	F.	2 years.	1 day.	2 days.	.....	.....	.....	Recovered. Wore tube 18 days.
348	.....	"	M.	4 years.	1 day.	3 days.	.....	.....	.....	Recovered. Wore tube 11 days.
349	.....	"	F.	19 months.	2 days.	7 days.	.....	Pneumonia.	.....	Died 5 days after intubation.
350	.....	"	F.	3 years.	3 days.	.....	.....	Extension to bronchi.	.....	Died 3 hours after intubation.
351	.....	"	M.	3 years.	2 hours.	2 days.	.....	Extension to bronchi.	.....	Died 3 days after intubation.
352	.....	Geo. McNaughton.	.....	4 years.	3 days.	Present.	Albumen.	.....	.....	Recovered.
353	.....	"	.....	3 years.	2 days.	.....	.....	Broncho-pneumonia.	.....	Died 40 hours after intubation.
354	.....	"	.....	6 years.	6 days.	"	.....	Sepsis.	.....	Died 24 hours after intubation.
355	.....	"	.....	3 years.	3 days.	"	.....	Broncho-pneumonia.	Measles.	Died 40 hours after intubation.
356	.....	"	.....	4 years.	3 days.	"	.....	.....	.....	Died 96 hours after intubation.
357	.....	"	.....	11 months.	2 days.	"	.....	Broncho-pneumonia.	.....	Died 36 hours after intubation.
358	.....	"	.....	3 years.	3 days.	"	.....	Fatal asphyxia after coughing out tube.	.....	Died 96 hours after intubation.

Number	Date.	Operator.	Sex.	Age.	Duration before intubation of		Urine.	Cause of death.	Complications.	Result.
					Laryngeal symptoms.	Pharyngeal diphtheria.				
359	.....	Geo. McNaughton.	....	5 years.	1 day.	Present.	Albumen.	Nephritis.	.....	Died 36 hours after intubation.
360	.....	"	....	19 months.	2 days.	"	.....	Broncho-pneumonia.	Measles.	Died 30 hours after intubation.
361	.....	"	....	3 years.	5 days.	"	.....	.....	.....	Recovered.
362	Sept., 1886	A. Caillé.	F.	2 yrs. 6 mos.	4 days.	8 days.	Albumen.	Broncho-pneumonia.	Scarlatina.	Died 4 hours after intubation.
363	Feb., 1887	"	F.	5 years.	7 days.	1½ week.	Not exam.	.....	.....	Recovered. Wore tube 4 days.
364	"	"	M.	2 yrs. 6 mos.	2 days.	4 days.	"	Broncho-pneumonia.	.....	Died 3 days after intubation.
365	"	"	F.	3 yrs. 6 mos.	3 days.	6 days.	"	Broncho-pneumonia.	.....	Died 2 days after intubation.
366	Mar., 1887	"	M.	4 years.	2 days.	4 days.	"	Double pneumonia.	.....	Died 2 days after intubation.
367	"	"	M.	1 year.	4 days.	After intubation.	"	Sepsis.	.....	Died 14 days after intubation.
368	April, 1887	"	F.	3 years.	2 days.	None.	"	.....	.....	Recovered. Wore tube 2 days.
369	"	"	M.	1 yr. 3 mos.	4 days.	"	"	Pneumonia; heart failure.	.....	Died 2 days after intubation.
370	"	"	F.	1 yr. 2 mos.	5 days.	"	"	.....	.....	Recovered. Wore tube 3 days.
371	"	"	F.	1 yr. 6 mos.	2 days.	3 days.	"	Pneumonia.	.....	Died 2½ days after intubation.
372	"	"	F.	7 years.	3 days.	None.	Albumen.	.....	.....	Recovered. Wore tube 2 days.
373	May, 1887	"	M.	5 years.	2 days.	3 days.	Not exam.	.....	.....	Recovered. Wore tube 4 days.
374	"	"	M.	2 years.	3 days.	4 days.	"	Sudden heart failure.	.....	Died 3 days after intubation.
375	May, 1886	W. K. Simpson.	M.	2 yrs. 6 mos.	4 days.	2 days.	None.	Extension to bronchi.	.....	Died 58 hours after intubation.
376	Oct., 1886	"	F.	3 yrs. 4 mos.	5 days.	None.	Albumen.	Extension to bronchi.	.....	Died 3 days after intubation.
377	Jan., 1887	"	F.	2 yrs. 7 mos.	3 days.	"	None.	Heart failure.	.....	Died 3 days 19 hours after intubation.
378	"	"	F.	7 years.	1 day.	1 day.	.....	Extension to bronchi.	.....	Died 2 days 6½ hours after intubation.
379	"	"	M.	5 years.	5 days.	.....	.....	Extension to bronchi.	.....	Died 2 days 3 hours after intubation.
380	Feb., 1887	"	F.	8 months.	1 day.	1 day.	.....	Extension to bronchi.	.....	Died 3 days after intubation.
381	Mar., 1887	"	F.	15 months.	1 day.	.....	.....	Sepsis.	.....	Died few hours after intubation.
382	April, 1887	"	M.	2 yrs. 8 mos.	3 days.	None.	.....	Pushing down membrane.	.....	Died — after intubation.
383	May, 1887	"	M.	3 years.	2½ days.	"	None.	Extension to bronchi.	.....	Died 30 hours after intubation.
384	"	"	M.	13 months.	1½ day.	6 days.	.....	Extension to bronchi.	.....	Died 26 hours after intubation.
385	May, 1886	G. H. Cocks.	F.	6 years.	2 days.	6 days.	Not exam.	.....	.....	Recovered. Wore tube 2 days.
386	Aug., 1886	"	F.	2 years.	2 days.	5 days.	"	Edema of lungs.	.....	Died 4 days after intubation.
387	Sept., 1886	"	M.	3 yrs. 10 mos.	1 day.	3 days.	"	.....	.....	Recovered. Wore tube 3 days 7 hours.
388	Oct., 1886	"	M.	5 years.	1 day.	.....	"	Extension to bronchi.	.....	Died 40 hours after intubation.
389	"	"	....	18 months.	1 day.	.....	"	Sepsis.	.....	Died 4 hours after intubation.
390	Nov., 1886	"	M.	3 years.	7 days.	.....	"	.....	.....	Recovered. Wore tube 4 days.
391	"	"	F.	2 yrs. 6 mos.	4 days.	7 days.	"	Sepsis.	.....	Died 4 days after intubation.
392	Feb., 1887	"	F.	3 years.	2 days.	7 days.	"	Sepsis.	.....	Died 3 days after intubation.
393	Mar., 1887	"	M.	18 months.	2 days.	4 days.	"	.....	.....	Recovered. Wore tube 3 days.
394	April, 1887	"	M.	2 years.	1 day.	4 days.	"	Extension to bronchi.	.....	Died 36 hours after intubation.
395	"	"	M.	4 yrs. 6 mos.	3 days.	4 days.	"	Extension to bronchi.	.....	Died 48 hours after intubation.
396	May, 1887	"	F.	5 years.	2 days.	.....	"	Extension to bronchi.	.....	Died 36 hours after intubation.
397	"	"	F.	9 years.	2 days.	.....	"	Paralysis of heart.	.....	Died 5 hours after intubation.
398	Mar., 1887	"	F.	2 yrs. 8 mos.	1½ day.	8 days.	"	Sepsis.	.....	Died 24 hours after intubation.
399	May, 1886	H. F. Ivins. ¹⁴	M.	23 months.	1 day.	1 day.	.....	.....	.....	Died 8 hours after intubation.
400	May, 1886	E. F. Ingalls. ²⁷	F.	4 years.	2 days.	5 days.	.....	.....	.....	Recovered. Wore tube 4 days.
401	June, 1886	"	F.	4 yrs. 8 mos.	40 hours.	.....	.....	.....	.....	Recovered. Wore tube 3 days.
402	"	"	....	2 years.	.....	Several days	.....	Exhaustion.	.....	Died 40 hours after intubation.
403	"	"	M.	5 yrs. 6 mos.	1 day.	None.	.....	Extension to bronchi.	.....	Died 39 hours after intubation.
404	"	"	....	.....	.....	.....	.....	.....	.....	.....
405	April, 1886	I. H. Hance. ²⁸	F.	13½ months.	1 day.	1 day.	.....	.....	.....	Died 20 hours after intubation.
406	"	"	M.	14 months.	1 day.	None.	.....	Extension to bronchi.	.....	Died 14 hours after intubation.
407	May, 1886	"	M.	23 months.	1 day.	1 day.	Albumen.	Sepsis.	.....	Died 1 day 8 hours after intubation.
408	June, 1886	"	F.	2 yrs. 3 mos.	3 days.	11 days.	.....	.....	.....	Recovered. Wore tube 4 days.
409	.....	J. A. Anderson. ³⁴	F.	3 yrs. 7 mos.	.....	Several days	"	Sepsis.	Sepsis.	Died 17 hours after intubation.
410	.....	"	M.	3 years.	.....	Present.	.....	.....	.....	Died 13 hours after intubation.
411	.....	"	....	2 yrs. 6 mos.	.....	None.	.....	Catarrhal bronchitis.	.....	Died 5 days after intubation.
412	.....	"	....	18 months.	.....	"	.....	Extension to bronchi.	.....	Died 72 hours after intubation.
413	.....	"	M.	26 months.	.....	Present.	.....	.....	.....	Recovered. Wore tube 19 days.
414	.....	"	F.	38 months.	.....	"	.....	Exhaustion.	.....	Died 14 hours after intubation.
415	.....	"	....	35 months.	.....	"	.....	Heart failure.	.....	Died 8 days after intubation.
416	.....	"	....	26 months.	.....	None.	.....	Extension to bronchi.	.....	Died 3 days after intubation.
417	.....	"	....	3 yrs. 6 mos.	.....	Present.	.....	Exhaustion.	.....	Died 2 days after intubation.
418	.....	"	....	17 months.	.....	None.	.....	Broncho-pneumonia.	.....	Died 20 hours after intubation.
419	Dec., 1886	Jos. Eichberg. ²	F.	3 years.	3 days.	.....	.....	.....	.....	Recovery. Wore tube 5 days.
420	Jan., 1887	W. E. Shaw. ²	M.	5 years.	1 day.	.....	.....	Extension to bronchi.	.....	Died 5 days after intubation.
421	"	"	M.	4 yrs. 6 mos.	.....	.....	.....	Extension to bronchi.	Measles.	Died 3 days after intubation.
422	"	Jos. Eichberg. ³⁵	M.	5 years.	.....	Present.	.....	Extension to bronchi.	.....	Died 1 day after intubation.
423	"	"	....	3 yrs. 7 mos.	1 day.	1 day.	.....	Exhaustion.	.....	Died 5 days after intubation.
424	"	"	M.	7 years.	1 day.	Several days	.....	.....	Tracheotomy to remove tube.	Recovered. Wore tube 5 days.
425	"	"	F.	5 years.	.....	Present.	.....	.....	.....	Recovered. Wore tube 8 days.
426	"	"	F.	3 yrs. 6 mos.	.....	.....	.....	.....	Measles.	Died 3 days after intubation.
427	Oct., 1886	A. S. Hunter.	F.	7 yrs. 6 mos.	2 days.	3 days.	Not exam.	Bronchitis.	Measles and bronchitis.	Died 2½ days after intubation.
428	Dec., 1886	"	F.	3 yrs. 6 mos.	4 days.	4 days.	"	Extension to bronchi.	.....	Died 2 days after intubation.
429	Jan., 1887	"	F.	2 yrs. 6 mos.	3 days.	2 days.	"	.....	.....	Died 15 hours after intubation.
430	Jan., 1887	J. B. Wheeler. ⁸	F.	3 yrs. 6 mos.	24 hours.	None.	.....	Laryngeal stenosis from sudden plugging of the tube by pseudo-membrane.	.....	Died 14 hours after intubation.

Number.	Date.	Operator.	Sex.	Age.	Duration before intubation of		Urine.	Cause of death.	Complications.	Result.
					Laryngeal symptoms.	Pharyngeal diphtheria.				
431	Dec., 1886	G. W. Mason. ⁹	F.	8 yrs. 6 mos.	4 days.	Present.	.....	Extension to the lungs.	.....	Died 2½ days after intubation.
432	"	"	M.	8 years.	2 days.	2 weeks.	.....	.....	.....	Recovery. Wore tube 5 days.
433	Jan., 1887	"	F.	4 years.	3 days.	.....	.....	Asthenia.	Followed whooping-cough and croupous pneumonia.	Died 12 hours after intubation.
434	—, 1886	C. G. Jennings. ¹⁰	F.	6 years.	3 days.	.....	.....	Exhaustion.	.....	Died 1½ day after intubation and ½ day after tracheotomy.
435	Aug., 1886	"	.....	12 months.	.....	None.	.....	Pneumonia.	Measles.	Died same day (?).
436	Sept., 1886	"	F.	4 years.	.....	Present.	.....	Extension to bronchi.	.....	Died 1 day after intubation.
437	—, 1886	"	F.	5 years.	.....	"	.....	Extension to bronchi.	.....	Died 6 days after intubation.
438	Oct., 1886	W. Cheatham. ¹²	F.	4 years.	2 days.	9 days.	.....	Extension to the bronchi.	.....	Died 17 hours after intubation.
439	—, 1886	"	.....	.....	.....	Present.	.....	Extension to the bronchi.	Pulmonary complications.	Died 24 hours after intubation.
440	Nov., 1886	"	F.	2 years.	1 day.	2 days.	.....	.....	.....	Recovered. Wore tube 3 days 21 hours.
441	"	"	F.	13 months.	.....	.....	.....	Not known.	.....	Died 41 hours after intubation.
442	Mar., 1887	Austin G. Case. ¹	F.	10 yrs. 6 mos.	3 days.	None.	.....	.....	.....	Recovery. Wore tube 8½ days.
443	Nov., 1886	David Prince. ³	M.	3 years.	.....	Several days	.....	.....	Under ether.	Recovery. Wore tube short time.
444	Dec., 1886	"	M.	7 years.	.....	None.	.....	.....	Under chloroform.	Recovered. Wore tube 4 days 10 hours.
445	Dec., 1886	L. L. Palmer. ⁴	F.	5 yrs. 3 mos.	2 days.	4 days.	.....	Extension to bronchi (?).	.....	Died 28 hours after intubation.
446	Jan., 1887	B. T. Shimwell. ⁵	M.	8 years.	4 days.	None.	Albumen.	Capillary bronchitis.	.....	Died 15 days after intubation.
447	Mar., 1886	L. L. Dunning. ³⁶	F.	2 yrs. 6 mos.	18 hours.	"	.....	Broncho-pneumonia.	.....	Died 3 days after intubation.
448	Nov., 1886	"	F.	2 yrs. 4 mos.	6 days.	Present.	.....	.....	.....	Recovery. Wore tube 3 days.
449	Dec., 1886	"	F.	2 yrs. 4 mos.	5 days.	.....	.....	Extension to bronchi.	.....	Died 2 days 8½ hours after intubation.
450	"	"	M.	3 yrs. 6 mos.	1 day.	5 days.	.....	.....	.....	Recovery. Wore tube 4 days 15½ hours.
451	Jan., 1887	"	F.	2 yrs. 3 mos.	6 days.	.....	.....	Exhaustion.	.....	Died 1 day after intubation.
452	Feb., 1887	Charles Denison. ⁷	M.	6 years.	12 hours.	12 hours.	.....	.....	Measles.	Recovered. Tube dislodged a cast of the larynx and the obstruction did not return.
453	April, 1887	N. S. Roberts.	F.	4 yrs. 5 mos.	2 days.	Present.	None.	.....	.....	Recovered. Wore tube 10 days.
454	May, 1887	"	F.	2 yrs. 9 mos.	1½ day.	"	.....	Sepsis.	Sepsis.	Died 13 hours after intubation.
455	.....	Langmann. ⁴²	F.	1 years.	1 day.	"	.....	.....	Schluckpneumonie.	Recovered. Wore tube 4 days.
456	Jan., 1887	Carl Beck.	M.	3 years.	2 days.	6 days.	Albumen.	.....	Measles.	Recovered. Wore tube 6 days.
457	Feb., 1887	"	M.	2 yrs. 6 mos.	20 hours.	3 days.	.....	Pneumonia.	"	Died 3 days after intubation.
458	"	"	M.	3 yrs. 3 mos.	12 hours.	4 days.	.....	.....	.....	Recovered. Wore tube 2½ days.
459	April, 1887	"	M.	4 years.	1½ day.	.....	None.	.....	.....	Recovered. Wore tube 4 days.
460	May, 1887	"	F.	6 years.	16 hours.	16 hours.	Albumen.	.....	.....	Recovered. Wore tube 2½ days.
461	June, 1886	T. H. Meyers.	M.	6 months.	3 days.	4 days.	None.	Convulsions.	.....	Died 45 hours after intubation.
462	July, 1886	"	M.	23 months.	1 day.	6 hours.	.....	.....	.....	Recovered. Wore tube 8 days.
463	Aug., 1886	"	M.	2 years.	1 day.	1 day.	.....	Pulmonary oedema.	.....	Died 23 hours after intubation.
464	Nov., 1886	"	M.	7 years.	1½ day.	.....	.....	.....	.....	Recovered. Wore tube 44 hours.
465	Jan., 1887	"	M.	2 years.	6 hours.	6 hours.	None.	Heart failure.	.....	Died 22 hours after intubation.
466	"	"	M.	4½ months.	.....	.....	.....	Pneumonia.	.....	Died 41 hours after intubation.
467	"	"	M.	3 yrs. 6 mos.	3 days.	1 day.	Albumen.	Heart failure.	Measles; pneumonia.	Died 6 days after intubation.
468	"	"	F.	25 months.	½ day.	.....	None.	"	.....	Died 73 hours after intubation.
469	Feb., 1887	"	M.	3 yrs. 6 mos.	1½ day.	None.	Albumen.	.....	Pneumonia.	Recovered. Wore tube 4 days.
470	Mar., 1887	"	M.	4 years.	½ day.	½ day.	.....	Nephritis.	"	Died 1 day after intubation.
471	April, 1887	"	M.	7 months.	4 days.	.....	.....	Heart failure.	Measles; pertussis.	Died 14 hours after intubation.
472	"	"	M.	3 years.	4 days.	3 days.	.....	"	Measles; pertussis.	Died 70 hours after intubation.
473	"	"	F.	3 yrs. 6 mos.	1 day.	1 day.	Albumen.	.....	Scarlet fever.	Recovered.
474	May, 1887	"	M.	3 yrs. 6 mos.	1 day.	1 day.	"	Tuberculosis.	"	Died 34 hours after intubation.
475	"	"	F.	3 yrs. 3 mos.	1 day.	½ day.	"	Nephritis.	Scarlet fever; measles.	Died 13 hours after intubation.
476	"	"	F.	3 yrs. 6 mos.	½ day.	½ day.	None.	Heart failure.	Scarlatina; measles.	Died 5 hours after intubation.
477	"	"	M.	3 years.	½ day.	None.	Albumen.	Sepsis.	Measles.	Died 43 hours after intubation.
478	"	"	F.	3 years.	14 hours.	1½ day.	.....	Exhaustion.	Scarlatina; measles.	Died 6½ days after intubation.
479	"	"	M.	4 yrs. 3 mos.	30 hours.	4 days.	"	"	Rötheln; pneumonia.	Died 20 hours after intubation.
481	"	"	F.	7 months.	½ day.	½ day.	.....	Convulsions.	.....	Died 42 hours after intubation.
482	"	"	M.	4 yrs. 4 mos.	2 days.	1 day.	Albumen.	Pneumonia.	Scarlatina; measles.	Died 10 days after intubation.
483	.....	D. C. Cocks.	M.	11 months.	.....	.....	.....	Oedema of lungs.	.....	Died 6 hours after intubation.
484	.....	"	M.	4 years.	.....	.....	.....	Extension to bronchi.	After tracheotomy.	Died.
485	.....	"	M.	8 years.	.....	.....	.....	.....	.....	Recovered.
486	.....	"	F.	3 years.	.....	.....	.....	.....	.....	Recovered.
487	.....	"	M.	4 years.	.....	.....	.....	Was moribund and never rallied.	.....	Died.
488	.....	"	F.	3 years.	.....	.....	.....	.....	.....	Recovered. Wore tube 5 days.
489	.....	"	F.	3 years.	.....	.....	.....	Oedema of lung.	.....	Died 48 hours after intubation.
490	.....	"	F.	2 yrs. 6 mos.	.....	.....	.....	Extension to bronchi.	.....	Died 7 days after intubation.
491	.....	"	F.	4 years.	.....	.....	.....	Extension to bronchi.	.....	Died 6 days after intubation.
492	.....	"	M.	2 yrs. 6 mos.	.....	.....	.....	.....	.....	Recovered. Wore tube 7 days.
493	.....	"	F.	4 years.	.....	.....	.....	.....	.....	Died 10 days after intubation.
494	.....	"	F.	7 years.	.....	.....	.....	Sepsis.	.....	Died 3 days after intubation.
495	.....	"	F.	3 years.	.....	.....	.....	.....	.....	Recovered. Wore tube 6 days.
496	.....	"	F.	5 years.	.....	.....	.....	Sepsis.	.....	Died 1 day after intubation.
497	.....	"	M.	4 years.	.....	.....	.....	Erysipelas.	After tracheotomy.	Died 9 days after intubation.
498	.....	"	M.	3 years.	.....	.....	.....	Oedema of lungs.	.....	Died 15 hours after intubation.
499	.....	"	.....	1 yr. 6 mos.	.....	.....	.....	Oedema of lungs.	.....	Died 48 hours after intubation.
500	.....	"	M.	4 years.	.....	.....	.....	.....	.....	Recovered. Wore tube 6 days.
501	.....	"	F.	3 years.	.....	.....	.....	Sepsis.	.....	Died 12 hours after intubation.
502	.....	"	F.	4 years.	.....	.....	.....	"	.....	Died.
503	.....	"	M.	3 years.	.....	.....	.....	Clogging of tube.	.....	Died 60 hours after intubation.

The foregoing tables give the details of 503 cases of laryngeal diphtheria treated by intubation. The following list includes, in addition to these, the result of 303 cases, the details of which I did not obtain.

Operator.	Cases.	Recoveries.	Operator.	Cases.	Recoveries.
Joseph O'Dwyer *	81	20	James McManus	5	2
F. E. Waxham	106	31	L. L. Dunning	5	2
Dillon Brown	87	18	C. G. Jennings	4	0
F. Huber	47	20	W. Cheatham	4	1
O'Shea	37	14	H. D. Ingraham	3	0
A. B. Strong	31	1	A. S. Hunter	3	0
J. M. Bleyer	42	11	G. W. Mason	3	1
W. P. Northrup	32	6	N. S. Roberts	2	1
C. E. Denhard	24	10	David Prince	2	2
F. Van Fleet	22	7	W. E. Shaw	2	0
D. C. Cocks	21	6	J. W. Niles	1	0
T. H. Meyers	21	4	E. C. Morgan	1	0
E. E. Montgomery	15	8	F. Donaldson, Jr.	1	0
G. H. Cocks	14	4	Charles Denison	1	1
A. Caillé	13	5	Langmann	1	1
E. F. Ingalls	12	3	Frank Tipton	1	1
J. Tascher	11	4	H. F. Ivins	1	0
W. K. Simpson	10	0	J. B. Wheeler	1	0
J. A. Anderson	10	1	A. G. Case	1	1
E. L. Cocks	10	3	L. L. Palmer	1	0
J. J. Reid	10	4	B. T. Shimwell	1	0
Geo. McNaughton	10	2	W. L. Carr	2	0
A. E. Hoadley	9	0	F. K. Priest	5	0
F. Henrotin	7	3	J. E. Winters	6	0
J. Eichberg	6	2	F. W. Merriam	3	2
H. O. Bates	6	3	S. A. W. Williams	3	0
W. H. Prescott	6	2	H. W. Berg	8	2
W. P. Bolles	5	2	J. L. Millinger	2	1
H. L. Smith	5	2	Harles	2	2
H. H. Mudd	6	2	E. D. Ferguson	1	0
I. H. Hance	5	1	F. C. Shaefer	4	0
Carl Beck	5	4	Forscheimer	5	2
G. W. Gay	4	0			

* Cases in private practice only.

Total number of operators, 65.
Total number of cases, 806, with 221 recoveries, = 27.4 per cent. Male, 225; female, 198; not stated, 383.
Average age of fatal cases, 3 years 2 months.
Average age of cases which recovered, 4 years 1½ month.
Duration of laryngeal symptoms before intubation in cases of recovery, 2 days 9 hours; in cases of death, 1 day 19 hours.
Urine contained albumen in 117 cases, and no albumen in 31 cases. Not stated in 658 cases.

In fatal cases, average length of life after intubation, 2 days 8 hours.
In cases of recovery, average time of tube in larynx, 5 days 3½ hours.
Cause of death in 339 cases:

Diphtheritic bronchitis	139
Pneumonia	55
Sepsis	37
Exhaustion	33
Nephritic complications	25
Heart failure	20
Pulmonary oedema	9
Bronchitis	9
Asphyxia, from clogging of tube	2
" " pushing down membrane	2
" " swelling over head of tube	1
" " neglect to notify operator after coughing out tube	4
Tuberculosis	2
Congestion of lungs	1
Scarlatina	1

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- 1 Medical Review, Pittsburgh, 1887, i., 114.
- 2 Cincinnati Lancet-Clinic, 1887, lvi., 97.
- 3 St. Louis Medical and Surgical Journal, 1887, lii., 115.
- 4 Canadian Practitioner, Toronto, 1887, xli., 1.
- 5 Medical Register, Philadelphia, 1887, i., 174.
- 6 Journal of the American Medical Association, 1887, viii., 199.
- 7 Journal of the American Medical Association, 1887, viii., 342.
- 8 New York Medical Journal, 1887, xiv., 238.
- 9 Medical News, Philadelphia, 1887, l., 341.
- 10 American Lancet, Detroit, 1886, N. S., x., 401.
- 11 Maryland Medical Journal, 1886, xvi., 67.
- 12 American Practitioner and News, Louisville, 1886, N. S., ii., 321.
- 13 THE MEDICAL RECORD, 1886, xxx., 665.
- 14 Hahnemannian Monthly, June, 1886. Reprint.
- 15 Chicago Medical Journal and Examiner, 1885, l., 475.
- 16 Archives of Pediatrics, Philadelphia, 1885, ii., 657.
- 17 Chicago Medical Journal and Examiner, 1885, li., 511.
- 18 Chicago Medical Journal and Examiner, 1886, liii., 353.
- 19 Chicago Medical Journal and Examiner, 1886, liii., 132.
- 20 Buffalo Medical and Surgical Journal, 1886, xxvi., 226.
- 21 Medical and Surgical Reporter, Philadelphia, 1886, lv., 586.
- 22 Maryland Medical Journal, Baltimore, 1886, xvi., 168.
- 23 Weekly Medical Review, St. Louis, 1887, xv., 57.
- 24 THE MEDICAL RECORD, New York, 1886, xxx., 487.
- 25 THE MEDICAL RECORD, New York, 1886, xxx., 683.
- 26 Medical Journal, New York, 1886, xliii., 384.
- 27 Journal of the American Medical Association, Chicago, 1886, vii., 35.
- 28 Chicago Medical Journal and Examiner, 1885, li., 401.
- 29 Chicago Medical Journal and Examiner, 1886, lii., 214.
- 30 THE MEDICAL RECORD, New York, 1886, xxix., 410.
- 31 Medical Register, Philadelphia, 1887, i., 146.
- 32 Journal of the American Medical Association, Chicago, 1887, viii., 337.
- 33 Journal of the American Medical Association, Chicago, 1887, viii., 359.
- 34 Pacific Medical and Surgical Journal, San Francisco, 1887, xxx., 129.
- 35 Cincinnati Lancet-Clinic, 1887, N. S., xviii., 321.
- 36 Journal of the American Medical Association, Chicago, 1886, vi., 426.
- 37 Journal of the American Medical Association, Chicago, 1886, vi., 147.
- 38 New York Medical Journal, 1886, xlii., 273.
- 39 New York Medical Journal, 1886, xlii., 322.
- 40 Medical Times, Chicago. Reprint.
- 41 THE MEDICAL RECORD, 1887, xxxi., 608.
- 42 New Yorker Medizinische Presse, 1887, iii., 259.

In closing the discussion, THE PRESIDENT said that the large gathering of fellows who came to listen to the papers of so many gentlemen on the same subject proved the interest the profession was taking in the new procedure. For, indeed, it was new, as he had taken an opportunity to say before the last meeting, in February, of the Medical Society of the State of New York. As he had stated on that occasion, it gave him pleasure to recognize the fact that Dr. O'Dwyer, in planning and perfecting intubation through patient labors extending over many years, had deservedly earned celebrity for himself and added to the discoveries which shed glory on the American profession. On the other hand, O'Dwyer's method of working, while apparently slow, was apt to teach our young men the lesson, that no great reputation is made by looking for premature notoriety, by rushing into print, and otherwise trying to harvest before sowing.

In regard to intubation, it was true that it had been tried and practised before. "Tubage" was introduced into French practice nearly thirty years ago.¹ Bouchut, then as to-day one of the active workers in Parisian medicine, tried to find a substitute for tracheotomy, and related cases in which a tube had been introduced into the larynx successfully. He claimed that the tube was carried into the larynx with the greatest ease, did not interfere with the movements of the epiglottis, was well tolerated by the larynx, relieved asphyxia in croup without tracheotomy being resorted to, and allowed the passage of false membranes. Indeed, and unfortunately, he went as far as to assert that a boy of three years, who had been intubated, spoke with a clear, loud voice.

This enthusiasm, to call it nothing else, carried him

¹ The subject is fully discussed in Contributions to Midwifery, and Diseases of Women and Children, etc., by E. Noeggerath, M.D., and A. Jacobi, M.D., pp. 397-400. New York, 1859.

too far. The Paris Academy of Medicine killed intubation in consequence of an adverse report made by Latour, Trousseau, and others. It was not heard of since.

If the study of the history of our science were more common among us than, unfortunately, it was, Dr. O'Dwyer would have found his task much easier. As he was not informed of the existence of previous efforts, he had to undergo a large amount of labor which might have been spared him. But, after all, his industry and ingeniousness had overcome every obstacle.

He was gratified at having had this opportunity of introducing to the Academy the array of observations presented. The profession of America and Europe would soon profit by it, and would often have to recur to the meeting of to-night as one of unusual importance. Personally, he would say that the first speaker (Dr. Huber) was quite correct in what he said of him, without mentioning his name. While appreciating the complimentary remarks referring to him, he acknowledged the correctness of the statement that, until a recent period, he never had anything but adverse criticism for intubation. Even in the third volume of "Pepper's Cyclopædia" he had expressed himself in the same spirit. He was willing and anxious to admit that he was then mistaken; that he was now, and had been for some time, convinced of the correctness of everything that had been claimed for intubation, and was looking forward for such improvements in instruments and methods as would make intubation more and more both easy and successful.



